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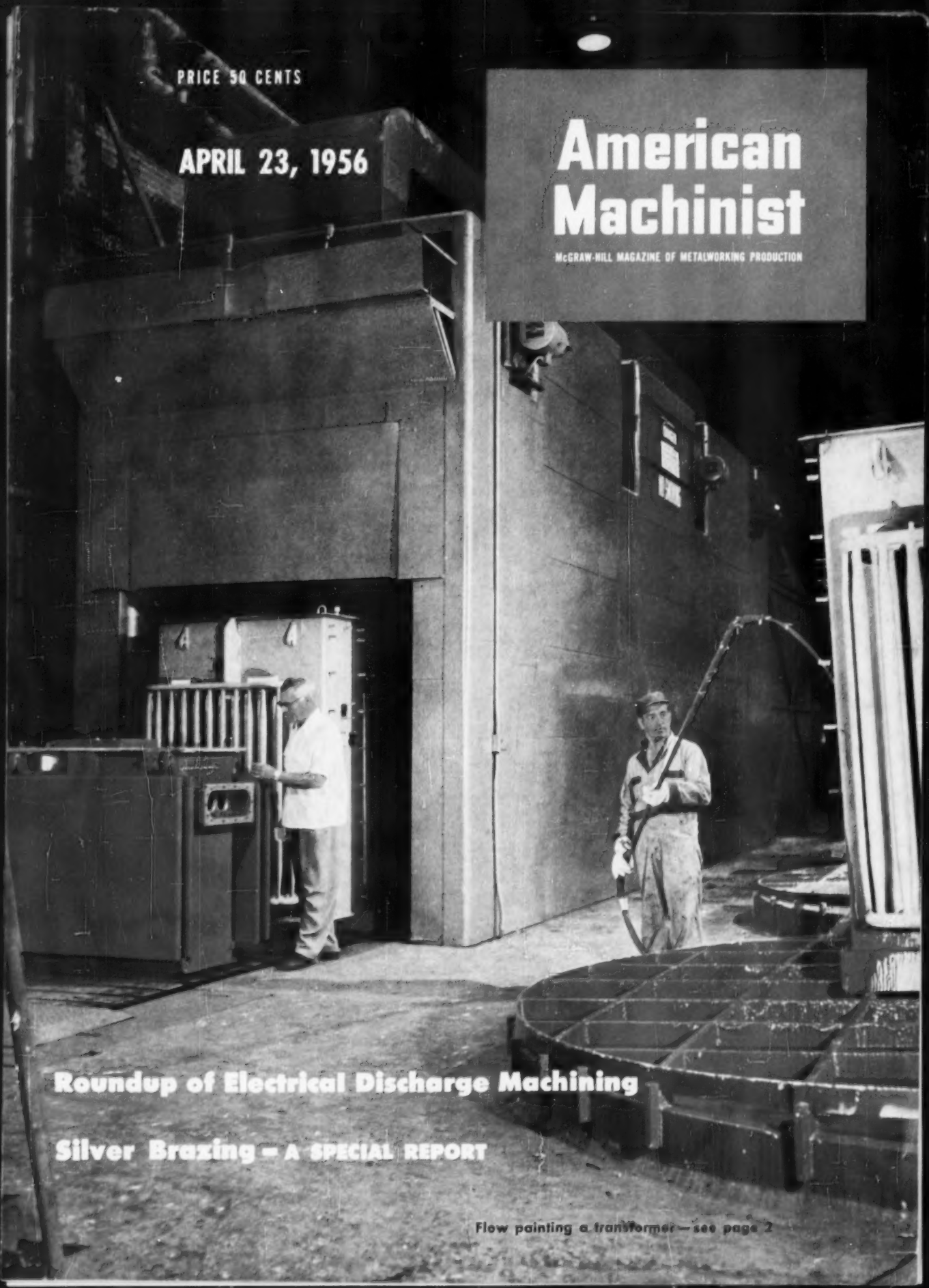
APRIL 23, 1956

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

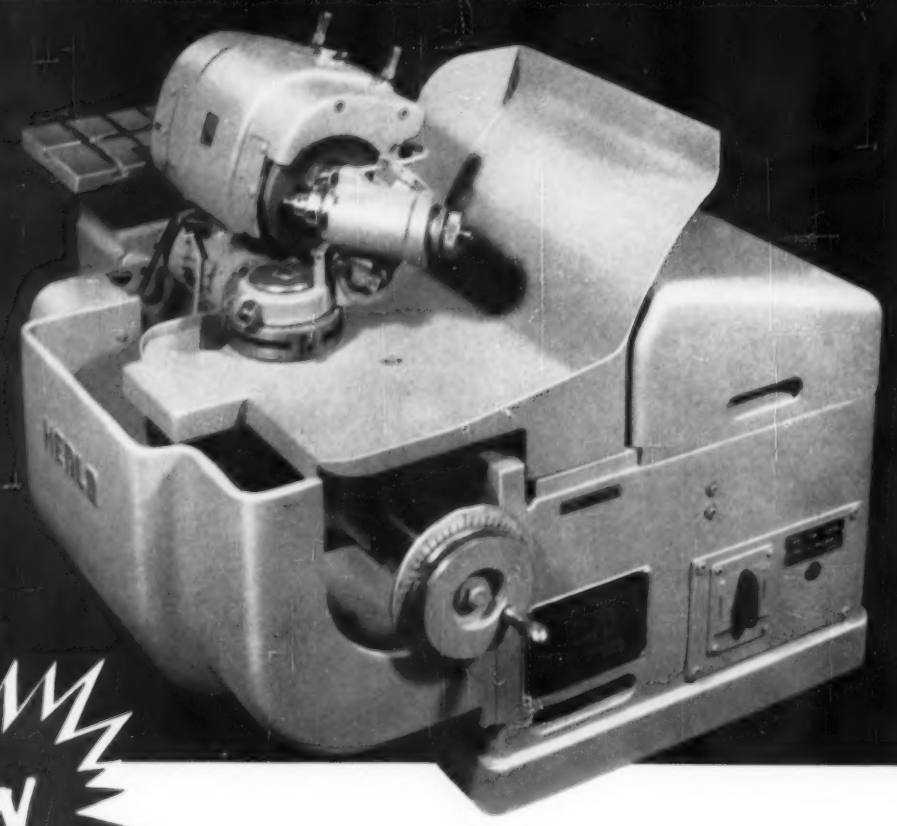


Roundup of Electrical Discharge Machining

Silver Brazing — A SPECIAL REPORT

Flow painting a transformer — see page 2

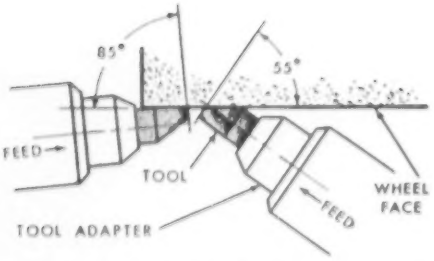
sharpen your tools with MACHINE PRECISION



new

HEALD MODEL 3 TOOL SHARPENER

saves time, gives longer tool life,
permits faster, more efficient borizing



The oscillating tool holder swings through an arc of up to 150°, to grind a maximum side angle of 85° on one side of the tool and 55° on the other side. Front clearance angles are adjustable from −10° to + 30° and tool radius can be set anywhere from 0 to 1¼". Precision calibrated scales eliminate guesswork and the mechanical machine cycle avoids any possibility of human errors or inaccuracies in the grinding operation.

LET's face it. Off-hand grinding just isn't precise enough for modern, high-speed borizing tools. To obtain maximum borizing efficiency, tools must be of the *precisely correct shape*—in complete conformity with *design specifications*.

With the new Model 3 Tool Sharpener, this requirement is met—and easily. Just dial the desired tool shape on the calibrated scales, clamp the tool in the holder and press the start button. Tool holder oscillation and wheel reciprocation are mechanically controlled, grinding up to five different angles and the radius with only an occasional hand adjustment for feeding the tool against the wheel. Precision is far greater than obtainable by off-hand grinding. What's more, any desired tool shape can be *exactly duplicated* again and again.

The mechanical precision built into this improved Model 3 machine assures a sharp, flawless cutting edge that will produce more and better work per sharpening. For complete details, send for Bulletin 2-4-2. IT PAYS TO COME TO HEALD!

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HEALD ®

American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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chips

FLOW PAINTING . . . Paint is applied to distribution-transformer tanks by a hose (see cover) at General Electric's Pittsfield, Mass, plant. Surplus paint falls through the supporting grating onto a self-cleaning rotating disk that automatically returns the paint to the supply tank for re-use. There are five of these flow pans to handle primer and the various special enamels. Each tank gets a primer coat and two or three coats of enamel.

AIR SEAL . . . Behind the flow-painting stand is the drying oven, notable because jets of heated air slant inward from each side of the doorway, eliminating the need for a door. Built by Michigan Oven Co, the 30-ft oven has a doorway 7 ft 10 in. wide by 11 ft 8 in. high—said to be the largest high-temperature opening ever sealed by this technique. Tanks weighing up to 5 tons travel through on a conveyor at 1 fpm. A similar air seal at the exit end is supplemented by swinging doors.

SILVER BRAZING . . . Strong joints by silver brazing, whether for short runs or mass production, are essential when this assembly method is employed today. Closer tolerances, new metals, brazing materials, fluxes, and heating methods are combining to mushroom the applications. Associate Editor George DeGroat rounds up latest practice in our current Special Report.

SHOCK SIMULATOR . . . Based on a familiar principle of physics, the shock simulator shows promise both for shock testing and as a press for high-velocity, high-impact forming. Executive Editor E J Tangerman uncovered the details at Convair, tells how it works, what it can do.

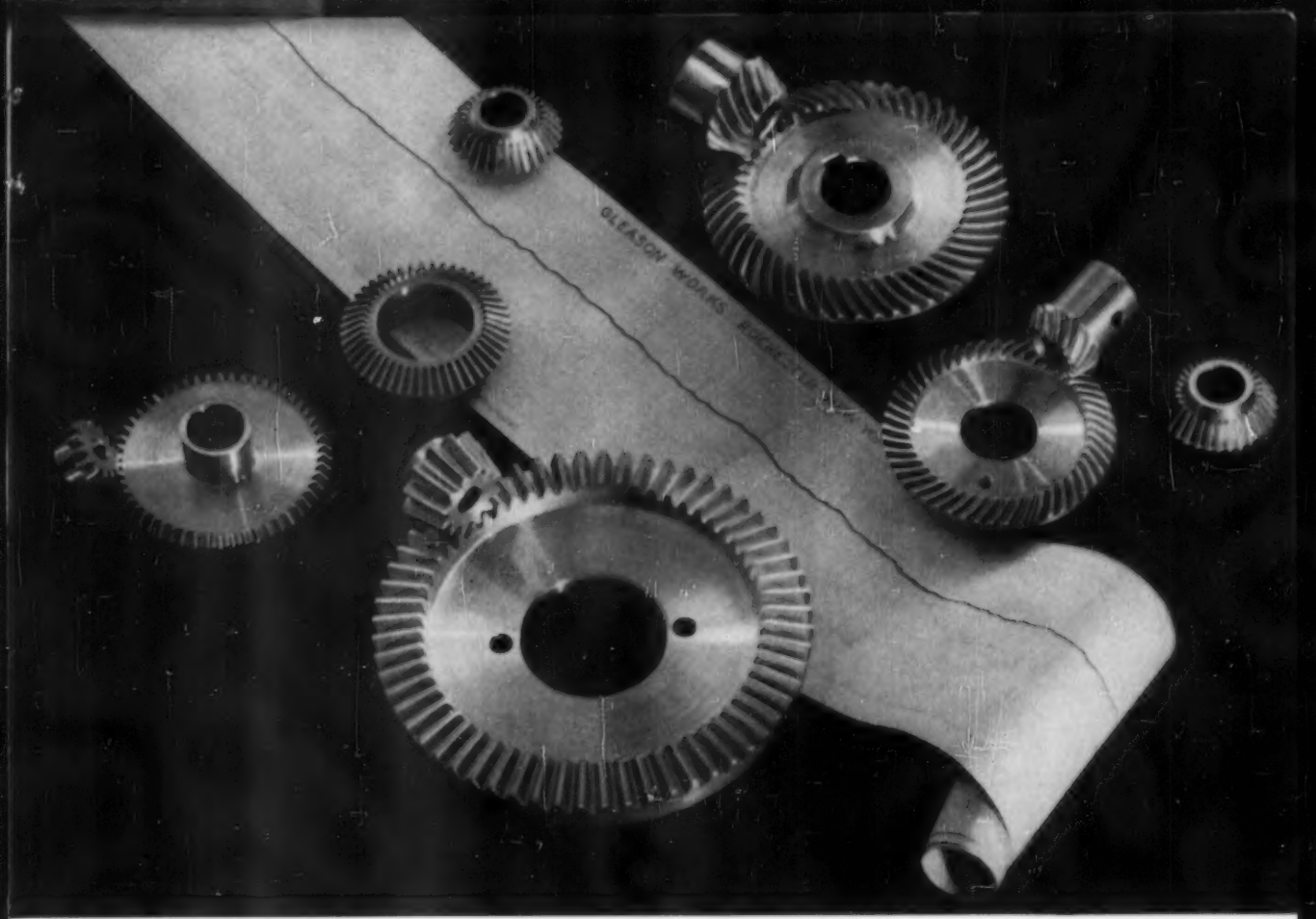
ELECTRICAL-DISCHARGE MACHINING . . . Whether you call it arc machining, erosion, or electrical discharge, this new machining technique is gaining adherents. We've brought you many articles on it before, but it seems time to give you a roundup on the techniques with examples of their work. R Decat, president, Abaco Industries, provides our lead article.

NEW STAINLESS . . . The new low-nickel, high-manganese stainless has been accepted in two standard compositions (201 and 202) that will handle most jobs now using 301 and 302. A study just completed by the Stainless Steel Committee, AISI, tells you when and how to use the new materials.

COMPRESSOR PRODUCTION . . . Need to cut costs and increase production inspired changes in machines, tooling, and methods at Chrysler's Airtemp Division. We bring highlights of the program that jumped production of compressors to more than four times the former level.

COMING . . . *AM* for May 7 will feature a Special Report on injection molding of plastics. There will be articles on how to weld superalloys, an unusual ultrasonic inspection, a tracer-controlled lathe for stainless, iron-powder electrodes, another in the Paquin series on 14 steps to design a die, plus several other articles and all the popular departments.

GEORGE WASHINGTON HONOR MEDAL "for outstanding achievement in bringing about a better understanding of the American way of life" has just been awarded by Freedoms Foundation at Valley Forge to E J Tangerman, executive editor, *American Machinist*, for his articles "How Tools Made the World in Which We Live" (AM—Dec 20 '54, p101), and "Doorway to a Better Tomorrow" (AM—Jul 4 '55, p117). Reprints of these award-winning Special Reports are still available.



For *the best* in fine pitch gearing . . .

Gleason Works now offers complete production and testing facilities for *any* fine pitch spiral bevel, hypoid, Zerol® or Coniflex® gears.

Bevel gears produced and tested with Gleason equipment assure the highest degree of accuracy obtainable in angular motion transmission. And, with the new methods and improved design incorporated in these Gleason machines, fine pitch gears can be produced at a lower cost than ever before!

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Three Gleason Generators cover the entire field of cut fine pitch bevel gears up to 4½" diameter. These include the No. 2A, 103 Straight Bevel Coniflex Generators, and the No. 2 Hypoid Generator. All three are automatic machines for jobbing or high-speed production and will improve quality besides increasing production.

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In gear manufacturing, testing is just as important as the actual gear cutting or grinding. One Gleason Tester—the No. 104 Hypoid Tester—checks the running qualities, tooth spacing and concentricity of gears up to 4¼" diameter.

An important new feature of the No. 104 is the provision for recording the rolling test on paper, giving a permanent record of tooth to tooth composite error. An electronic pickup head for a recorder is furnished, and the recorder itself may be engaged or disengaged, as required.

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Cutter sharpeners and complete tooling are available to suit your requirements. In addition, the services of the Gleason Engineering Department are at your disposal, at no obligation to determine the best fine pitch gears for your application and the machinery required to produce them. Write for further information.

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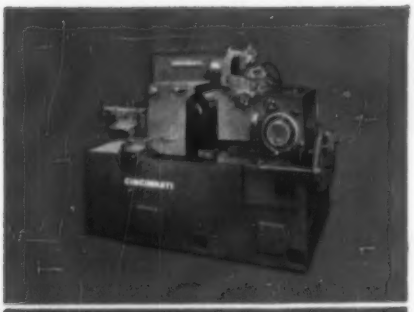
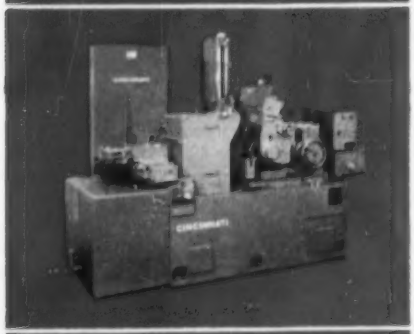
CINCINNATI® FILMATIC No. 0 Centerless Grinder. 5 hp spindle drive, 0 to ⅛" diameter capacity. Catalog No. G-640-1.

It Takes

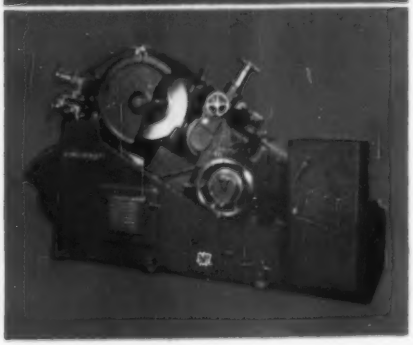


to Centerless from Synthetic

CINCINNATI® FILMATIC No. 2 Centerless Grinder. 15 hp spindle drive, 1/16" to 4¾" diameter capacity. Catalog No. G-644-1.



CINCINNATI® FILMATIC No. 3 Centerless Grinder. 25 hp spindle drive, ½" to 6" diameter capacity. Catalog No. G-664.



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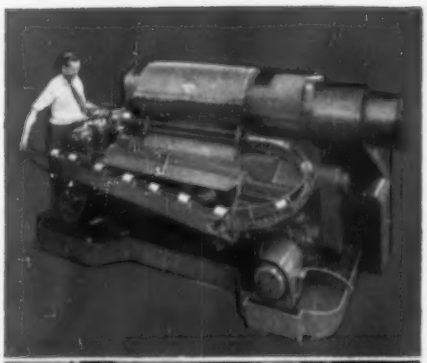
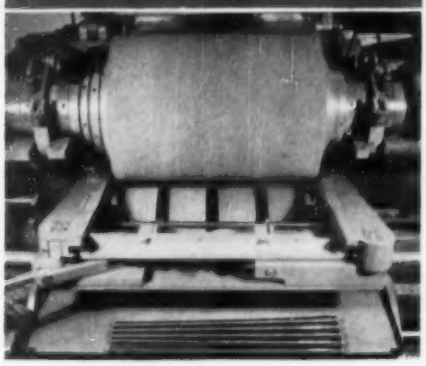
CINCINNATI® FILMATIC No. 4 Centerless Grinder. 30 hp spindle drive, ½" to 9" diameter capacity. Catalog No. G-538-2.



Pistons take a round trip through this **CINCINNATI® FILMATIC No. 5 Centerless Grinder** to get an extra fine finish and close tolerance sizing. The No. 5's (up to 75 hp spindle drive) are tooled up for the job.



Shotgun barrels receive a uniform lustre their entire length, comprising five tapers and a straight section, by grinding them on this **CINCINNATI® FILMATIC No. 6 Centerless Grinder.** The No. 6's (up to 75 hp spindle drive) are tooled up for the job.

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Grind Everything
Sapphire to Shotgun Barrels

Centerless is a versatile process of precision grinding. Railroad car wheel axles, billiard balls, synthetic sapphire, carbon sticks, 32" long gun barrels . . . all are ground at much lower cost on Cincinnatis than by any other method known today. And for these diverse parts, and thousands in between, it requires a line of Centerless Grinders.

Cincinnati builds the only complete line of centerless grinders, from 5 hp to 75 hp spindle drive. Cincinnati offers the only Engineering Service experience in centerless grinding extending over 30 years.

CINCINNATI Centerless is versatile, and variety of applications are still growing. May we help you reduce the cost of your precision grinding operations? Send blueprints and complete details, or if you handle your own tooling, write for catalogs on the machines in which you are interested. You will find brief specs. in Sweet's.

CINNATI

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LINE

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Deviations of the "red line" on a chart from a Fellows Gear Inspection Instrument, not only warn of costly gear errors—but indicate the nature of that error. Proper adjustments can thus be made immediately before expensive rejects accumulate in long production runs.

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Here's a Profitable Equation:

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RESULT

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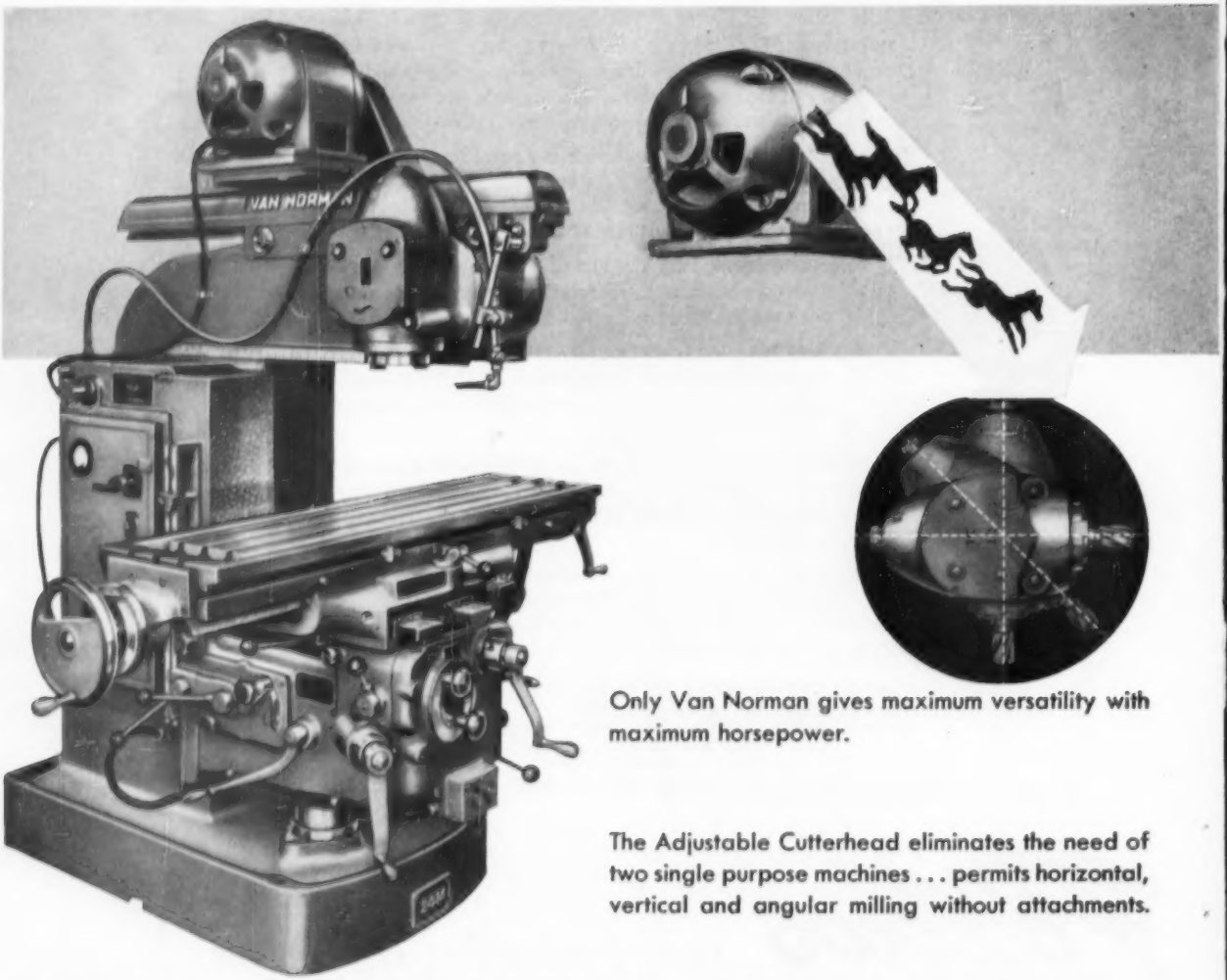

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The Adjustable Cutterhead eliminates the need of two single purpose machines . . . permits horizontal, vertical and angular milling without attachments.

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=2 Single Purpose Machines

Which would you rather have?

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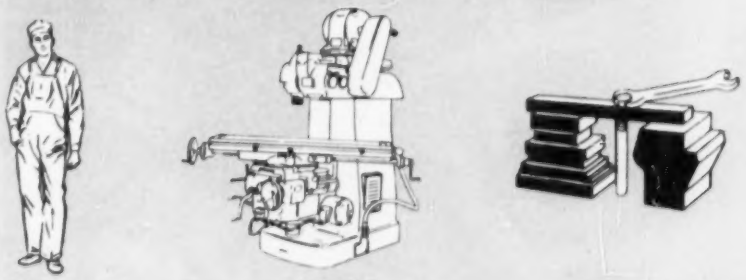
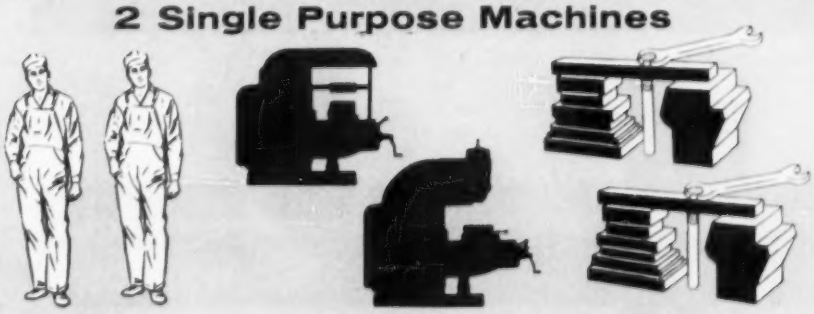


1 Operator | 1 Machine | 1 Complete Setup

or

2 Single Purpose Machines



2 Operators | 2 Machines | 2 Complete Setups

You can own a Van Norman Ram Type Milling Machine for as little as $.81 per day per $1000. investment.

Write for catalog and purchase plans giving complete details on all Van Norman Ram Type Millers.

Don't wait . . . for extra profits install a Van Norman now! They are available on five purchase plans — Outright sale . . . Purchase on conditional sales contract up to 5 years . . . Pay as you depreciate . . . Straight lease . . . Lease with option to buy. See your dealer or write Van Norman Company.

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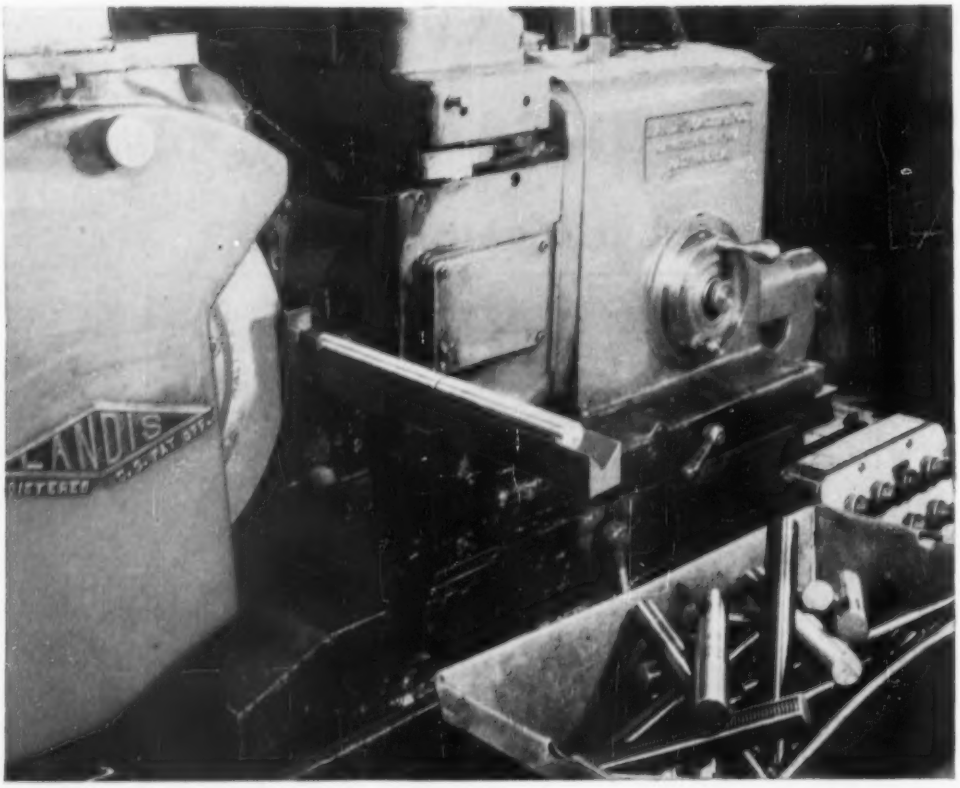

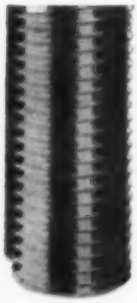

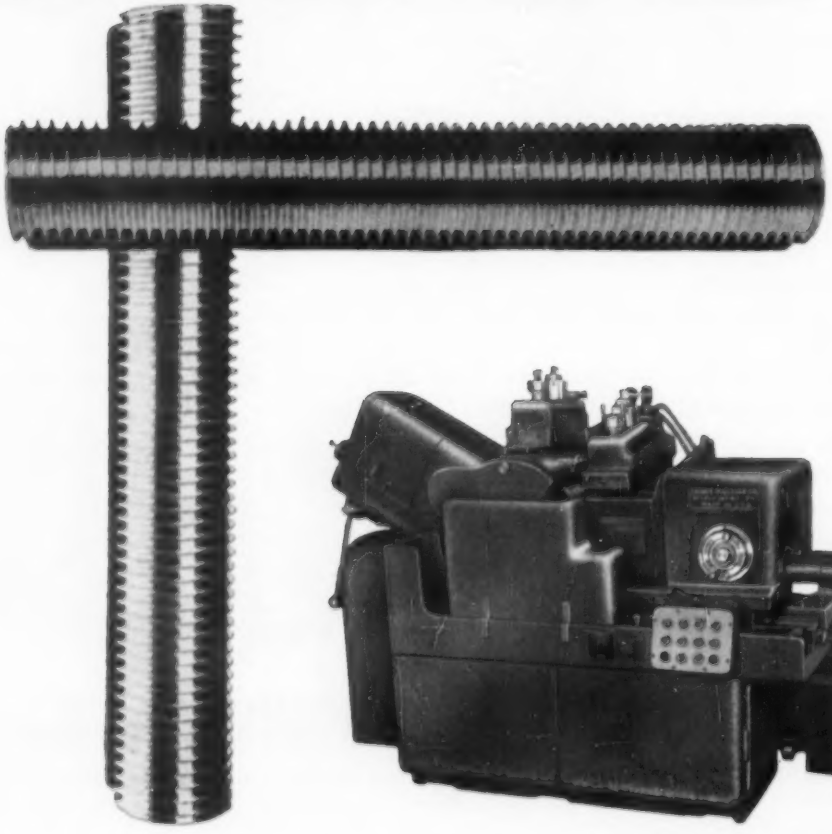

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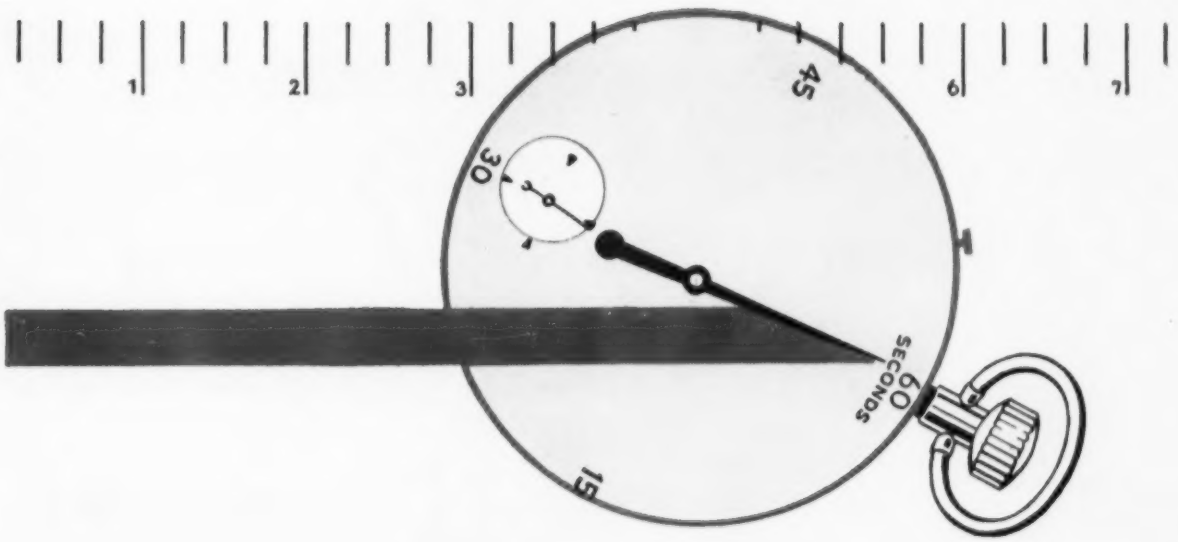

Threads 7¼" per Minute by CONTINUOUS GRINDING

LANDIS Centerless Thread Grinders are being used at the Kilbourn Engineering Company in Milwaukee, Wisconsin, to produce continuous threaded studs for high-pressure high-temperature service.

Studs ranging from ⅝" to 1⅜" in diameter are threaded from blanks of SAE 4140 steel heat-treated to a 260-320 Brinell hardness. In the operations illustrated, 1⅛" 8 pitch UN threads must be generated 10" long to a Class 7 fit to meet ASA standards (Manual B1.4). These threads are produced with LANDIS #1 Centerless Thread Grinders by continuous thru-feed grinding at the rate of 7¼ linear inches per minute, **or better.** The excellent quality and smooth finish of the ground thread has reduced final assembly time and minimized galling.

Centerless Thread Grinders, manufactured exclusively by LANDIS, are designed for the high-speed threading of a wide variety of workpieces from 1/16" to 4¾" in diameter. Blanks having one or more diameters, requiring threads on the outer diameter, can be threaded automatically by the thru-feed process used here.

Centerless Thread Grinding, by utilizing the "up-grinding" technique, is also well-adapted for threading workpieces of high hardness and coarse pitch. This process allows up to 30% higher work surface speeds, and often eliminates secondary threading passes required by other methods. For further information, send specifications and ask for Bulletin E-97.

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THE WORLD'S LARGEST MANUFACTURERS OF THREAD GENERATING EQUIPMENT

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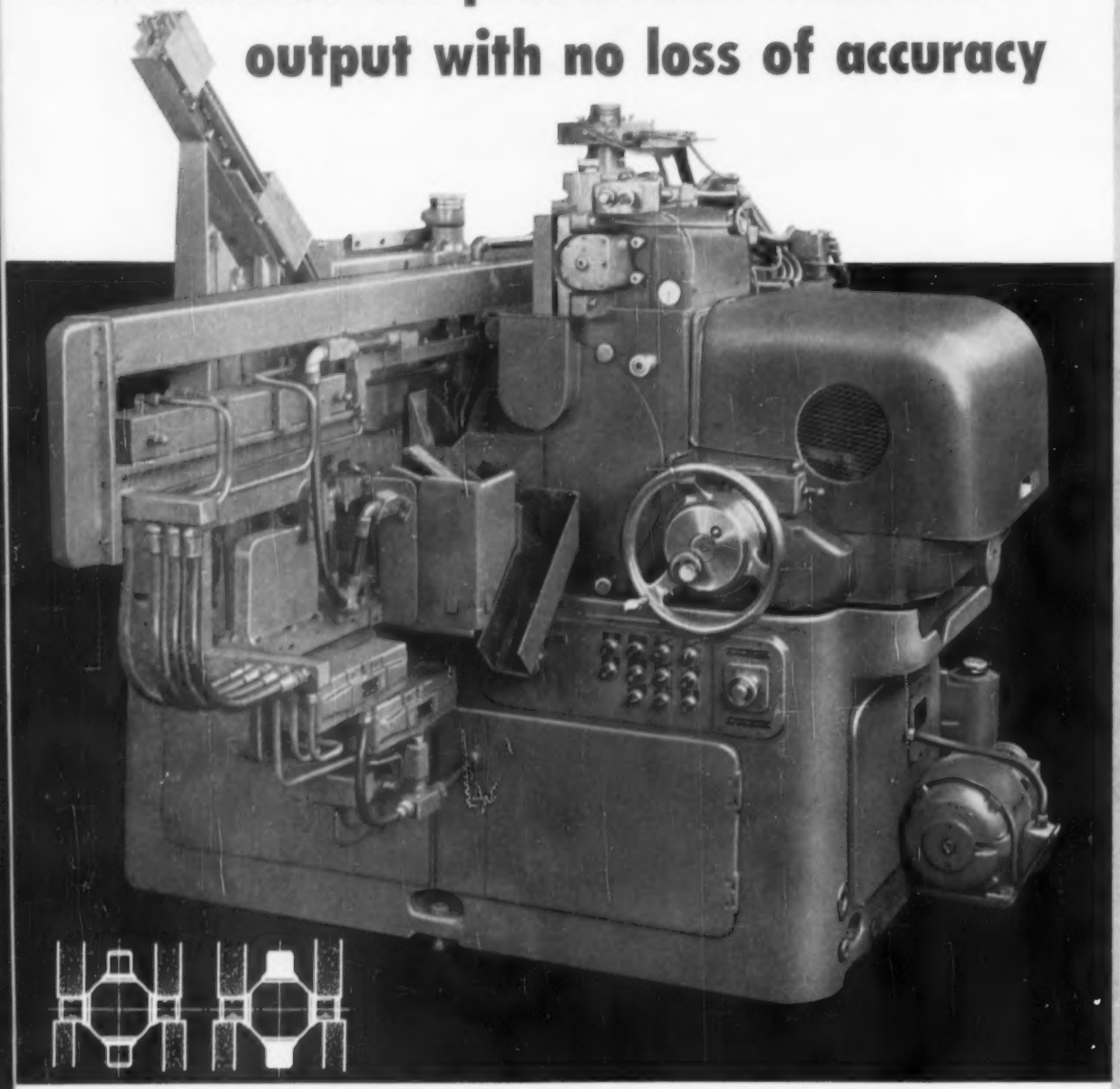
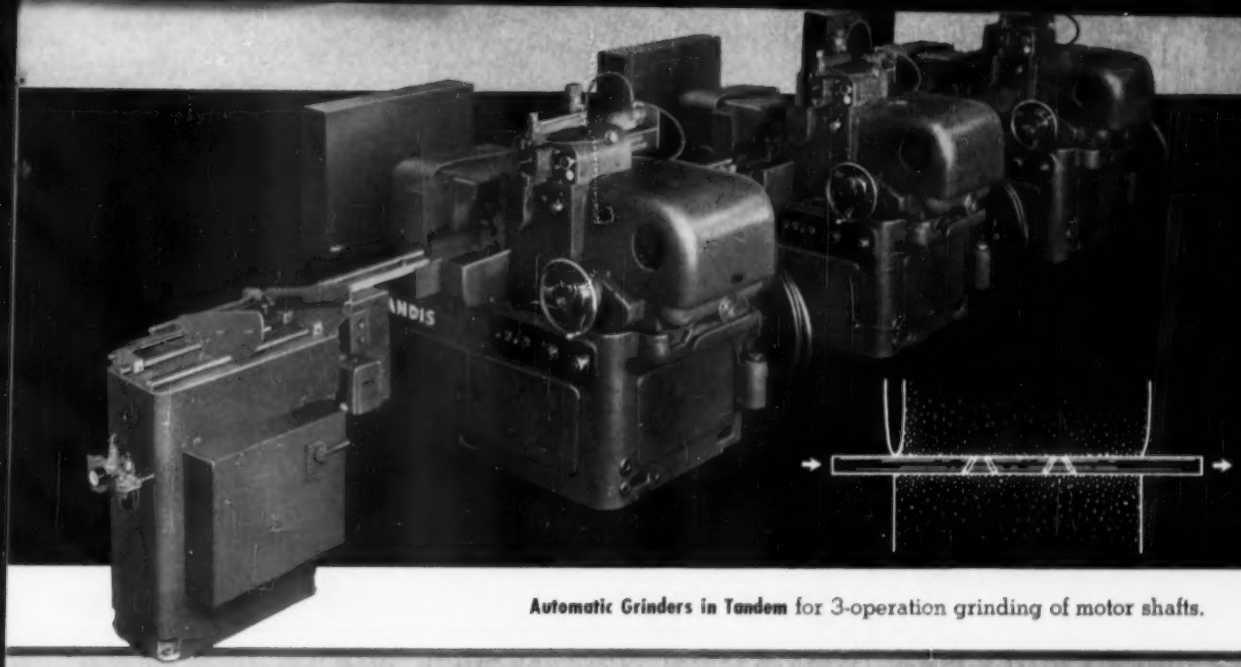


Automatic Grinding of Four Diameters and radii of universal joint spiders in one loading. Production is 250 per hour.

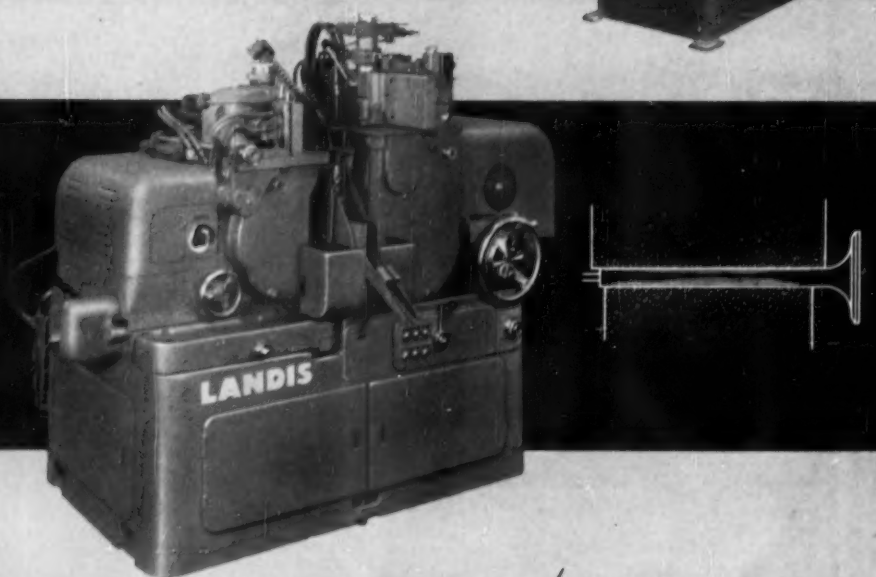
LANDIS

precision grinders



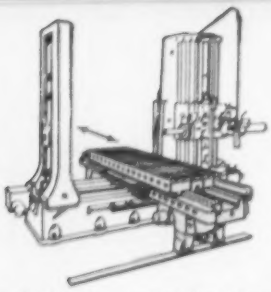
Automatic Grinders in Tandem for 3-operation grinding of motor shafts.

Automatic Grinding of Small Crankshaft. Production is 375 pieces per hour.

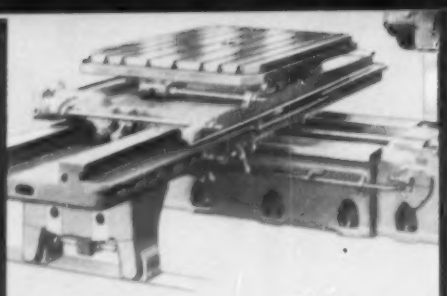


Automatic Finish Grinding of 1320 automotive valves per hour.

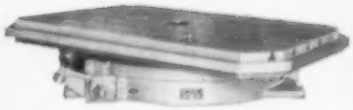
LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA



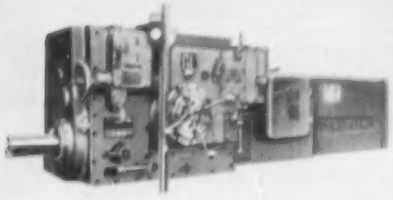
Increased table sizes, extended saddles, saddle supports and auxiliary runways — foundations in-the-floor or over-the-floor types.



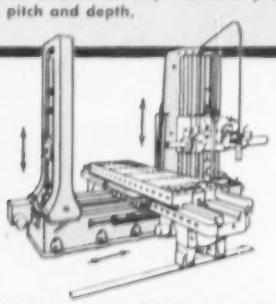
Built-in rotary tables with power milling feeds available with round, square or rectangular platens in various sizes.



Auxiliary combination plain and hand feed rotary tables available with round, square or rectangular platens in various sizes.

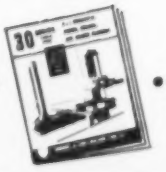


Built-in thread lead device permits cutting of precision threads to any standard prescribed form, pitch and depth.

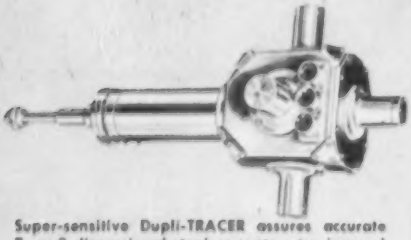


Full ribbed column and bed assures maximum rigidity. Machines available in various increased column and end support heights plus increased bed lengths.

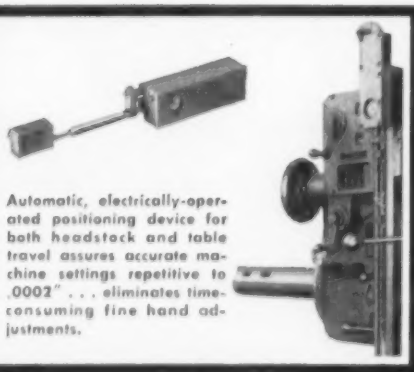
Giddings & Lewis 30 Series table-type machines give you more optional arrangements . . . more accessories . . . more attachments than any other horizontal bar in the world!



• For complete specifications on G&L 30 Series Table-Type Horizontal Boring, Drilling and Milling machines ask for Bulletin No. 345.



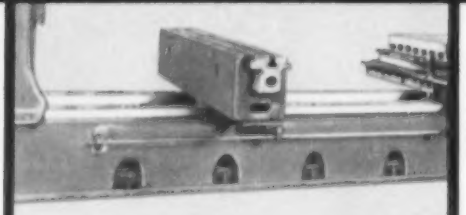
Super-sensitive Dupli-TRACER assures accurate 2- or 3-dimensional stepless contour tracing and 360° profiling. Another important feature is a manual steering control.



Automatic, electrically-operated positioning device for both headstock and table travel assures accurate machine settings repetitive to .0002" . . . eliminates time-consuming fine hand adjustments.

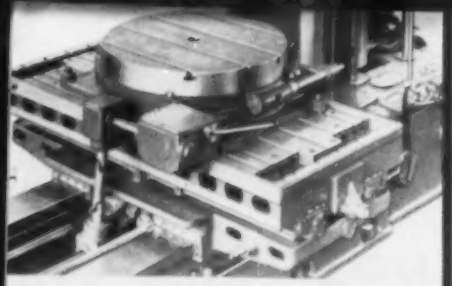
Heavy-duty, single-spindle, angular milling attachment operates at right angles to machine spindle. Offers unusual flexibility for machining hard-to-reach surfaces.

Continuous feed facing and boring heads used either separately or in combination with other attachments or accessories for turning, facing, threading, back facing, grooving, etc. Telescopic, right angle and facing tool holders, and high speed grinder are also available.

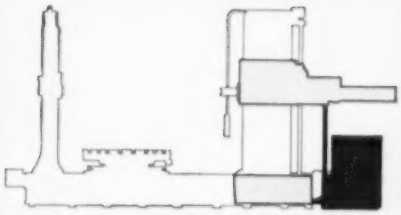


Plain or sliding platen auxiliary tables, mounted between table and end support, add extra rigidity in machining long workpieces which overhang the width of table.

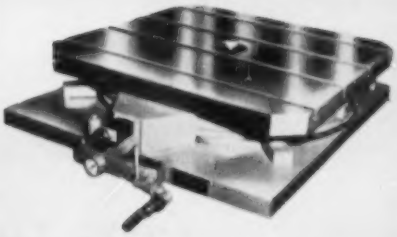
Improved measure device, used in conjunction with precison end measure rods (complete sets or individual units) is employed where extreme accuracy is required — readings to .0001". Device includes vertical and horizontal measuring unit to indicate vertical travel of headstock . . . cross travel of table on saddle . . . also for transverse saddle movement.



Auxiliary combination plain, hand and power take-off feed rotary tables available with round, square and rectangular platens in various sizes.



The exclusive G&L "Lubri-Cool" system, shown connected to headstock and milling feed unit, assures machining accuracy under heavy loads and in ambient temperatures.



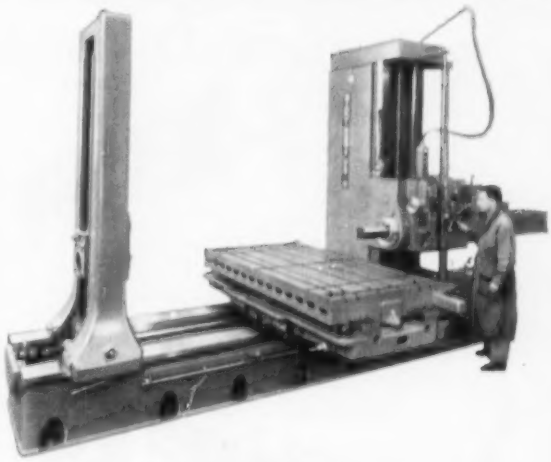
New G&L Air-Lift rotary table literally "floats on air." Capable of 360° indexing off center loads . . . eliminates multiple setups. Available with round, square or rectangular platens.

Here's why the world's favorite, profit-making Horizontal Boring, Drilling and Milling machines are Giddings & Lewis 30 Series, table-types — Model 340-T with 4" dia. spindle (20-hp motor) and Model 350-T with 5" dia. spindle (25-hp motor). It's because of their ability to be adapted to handle an extremely broad range of work when equipped with any of a big variety of optional equipment, attachments and accessories.

Year in and year out these machines continue to offer you more new features — such as the exclusive "Lubri-Cool" system. You'll discover too, that no other machine on the market today offers you so many distinct performance and capacity boosting features for boring, drilling and milling.

Yes, there's no better time than now to find out how much more work these machines can do in your shop. Contact your Giddings & Lewis representative today. He'll be glad to give you all the facts.

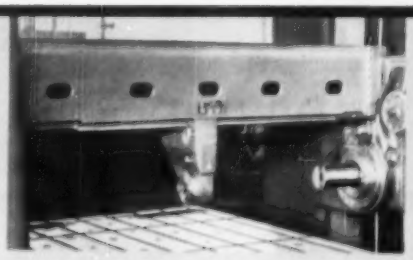
G-58



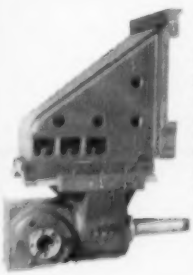
G&L *and* HYPRO DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines—table, floor and planer types; HYPRO Double Housing and Open Side Planers, Planer Type Milling Machines and Vertical Boring Mills; Vertical Turret Lathes; Spar and Skin Milling Machines, and VARIAX machines.

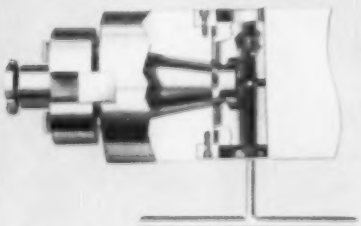
Heavy-duty, two-spindle angular milling attachment handles heavy cuts with high power outer spindle. Medium-duty inner spindle used for a wide range of drilling, boring, light milling and other work.



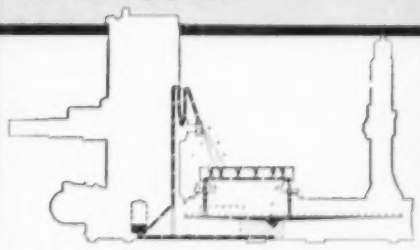
Cross-rail type arbor support in various lengths permits setting of milling cutters at any position over the table. It's ideal for slab, gang and straddle milling operation.



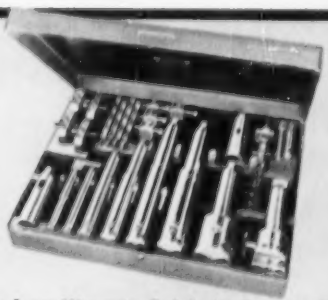
Right angle, heavy-duty sliding-head angular milling attachment with adjustable overarm support is practical for heavy milling, boring, drilling, reaming, etc. Medium-duty unit also available for machining at any angle in large openings and cavities.



Optional Quick-Change or Morse taper spindles available. Quick-Change spindle positively retains or ejects cutting tools by means of a simple wrench adjustment.



High volume coolant system on 30 Series machines assures an adequate supply of coolant to cutting tool. Table tee-slots are closed at the ends . . . table and saddle drilled allowing coolant to pass into a trough attached to bed of machine. Coolant tank is cast in the bed, or optional tank may be installed in floor.



Davis Super Micrometer Stub Boring Tools, available in complete sets, speed boring in production and tool room work. Line bars with block type or micrometer expansion tools also available.

speed grinder are also available.

hang the width of table.

means of a simple wrench adjustment.

optional tank may be installed in floor.

type or micrometer expansion tools also available.

what you've been asking for—
the new Bryant "Centalign"
Automatic Internal Grinder

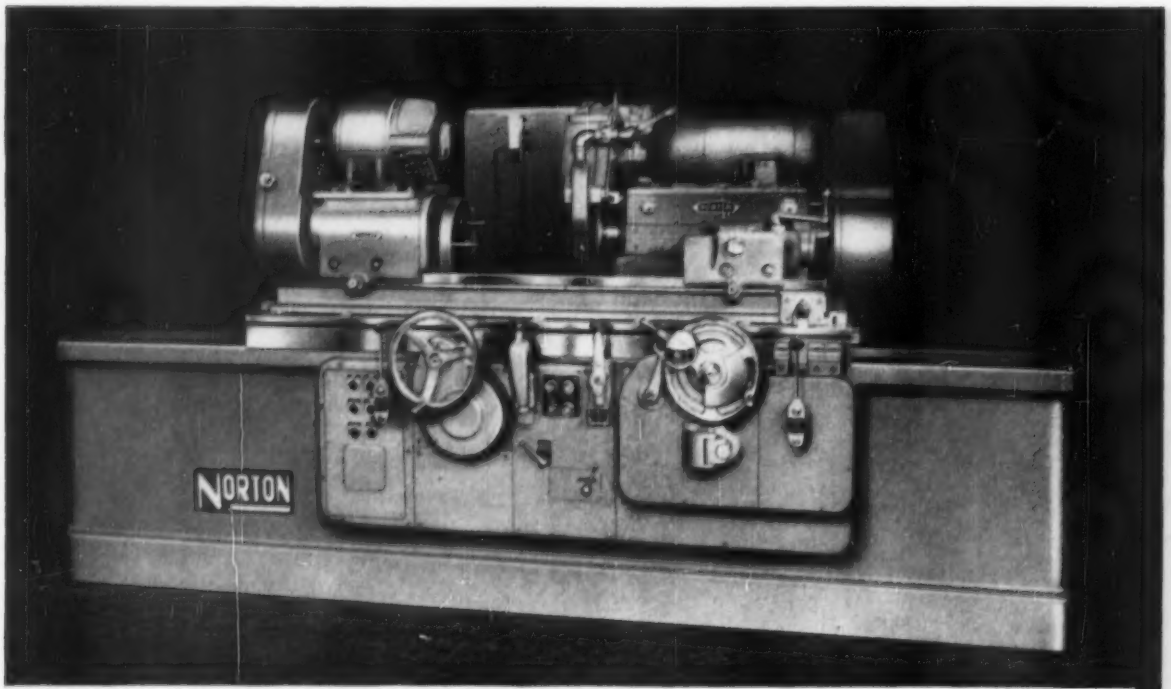
Designed and built to your requirements (as expressed to us over several years) for a machine capable of high production, lower-cost internal grinding, embodying the latest developments in shoe centerless grinding and adapted to automated lines. Ask for a demonstration.

BRYANT Chucking Grinder Co.

10 CLINTON STREET, SPRINGFIELD, VERMONT

Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates • Magnetic Drums for Computers



A NORTON TYPE CTU SEMIAUTOMATIC CYLINDRICAL GRINDER. The fastest, most economical and versatile grinding machine of its type. One-lever control of the automatic grinding cycle reduces the operator's duties to loading and unloading. Both the 6" and 10" Type CTU's are available as semiautomatics or as plain machines.

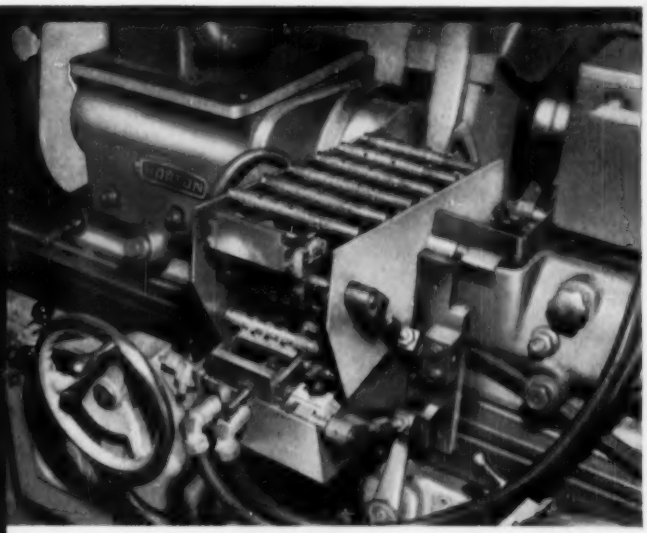
Norton Type CTU Cylindrical Grinders are packed with features for...

Production line and job shop users report that Norton 6" and 10" Type CTU cylindrical grinders have doubled and tripled production, replaced several machines and eliminated costly extra operations.

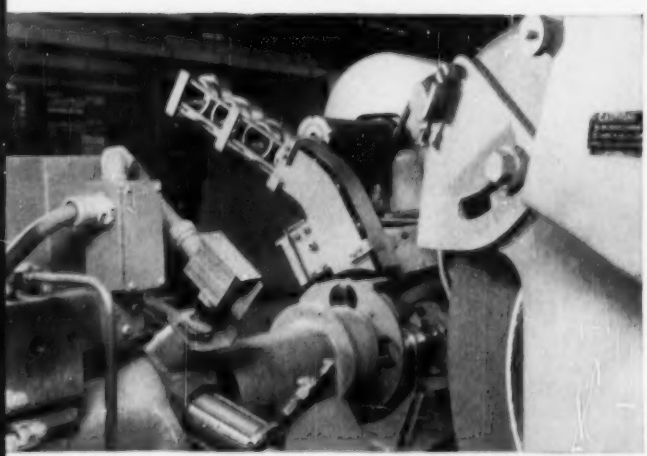
That's because of the many time-and-work-saving "Touch of Gold" features — standard and auxiliary — available with these grinders.

Some of the expertly automated auxiliary features are described here. Check them carefully — and figure their value to your own cylindrical grinding operations. And remember: only Norton offers you such long experience in both grinding machines and wheels to bring you the "Touch of Gold" that helps you produce more at lower cost. For further facts, see your Norton Representative, or write to NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

THE SWIVALIGN* ELIMINATES CUT-AND-TRY. Another Norton "Touch of Gold" development for faster, better, lower cost grinding. The SWIVALIGN Dual Electric Indicator, available for Norton cylindrical and universal grinders, enables operators to adjust the angular positions of swivel tables quickly and accurately, eliminating the usual cut-and-try guesswork. Featuring positive response and easy operation, this accurate instrument saves grinding time and money.

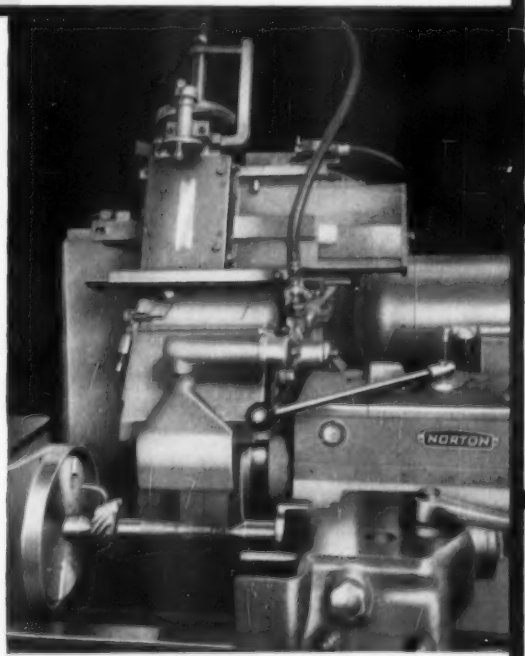


RAIL TYPE



TURRET TYPE

YOUR CHOICE OF AUTOMATIC LOADING DEVICES. Two types of Norton automatic loading devices are obtainable with 6" and 10" Type GTU semiautomatic grinders. The rail type loader is designed to handle a variety of small shafts. The turret type loader handles workpieces which must be chucked. Thanks to their steadily paced, automatic operation these Norton-developed loading mechanisms can be adapted to full automation. Or, they make it possible for one operator to tend a battery of machines, speeding production and cutting unit costs day after day.



WHEEL HEAD MOUNTED AUTOMATIC TRUING OFFERS BIG ADVANTAGES. A Norton automatic truing device, as shown here on a Type GTU grinder, quickly repays its original cost. It speeds up production, increases wheel life and increases diamond life. Also, it decreases the skill and effort required with hand truing. Operation is extremely simple. Once the original settings are made, all you do is push a button. Then the diamond automatically makes its round trip across the wheel face, at pre-determined speed and feed. Easy adjustments assure correct settings for each job . . . Another step forward in automatic grinding!

NORTON

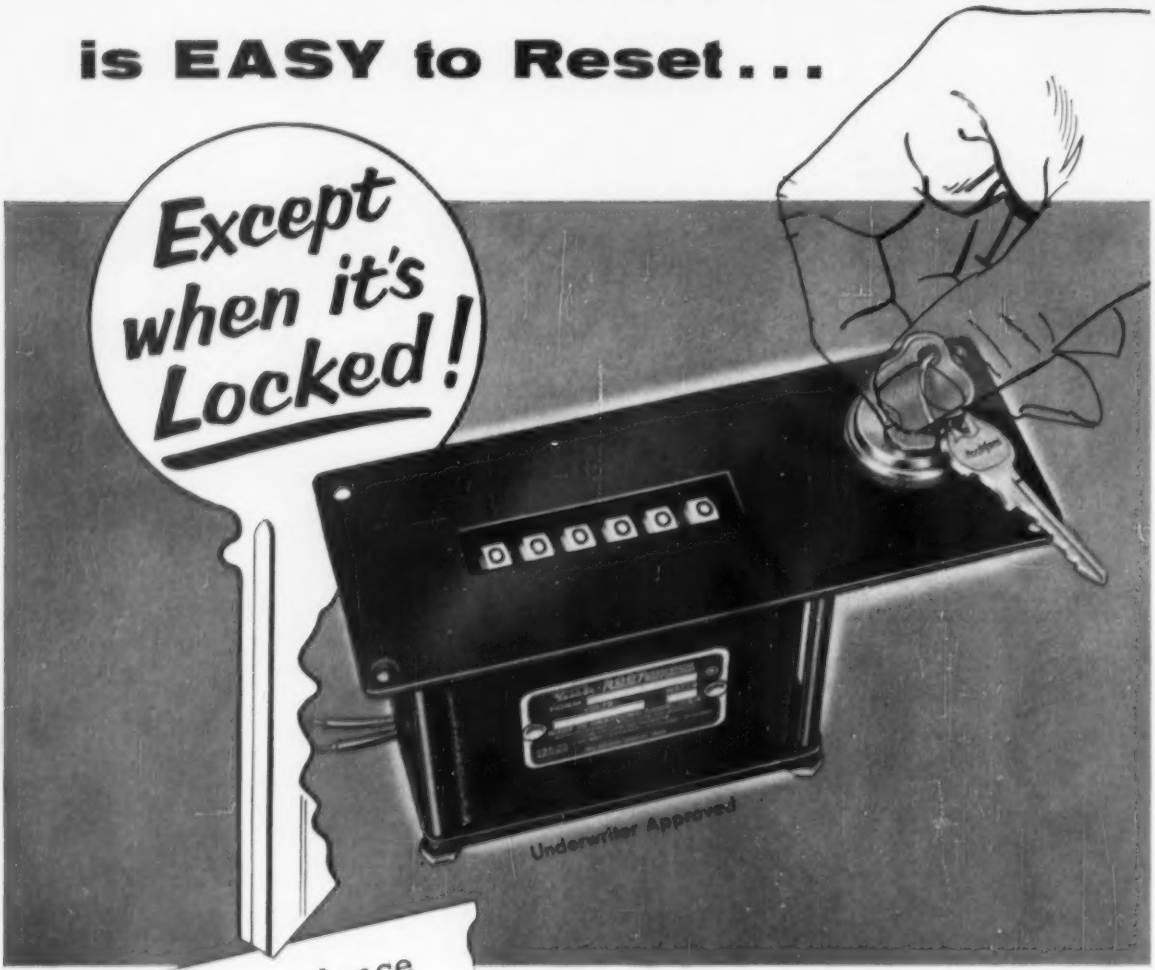
GRINDERS and LAPPERS

Making better products . . . to make your products better

District Offices: Worcester • Hartford • New York Area, Teterboro, New Jersey • Cleveland • Chicago • Detroit

*SWIVALIGN — Norton trade name for Dual Electric Indicator for accurate measurements of swivel table adjustment.

This NEW Magnetic Counter is EASY to Reset...



Added Evidence that —

Everyone Can Count on VEEDER-ROOT

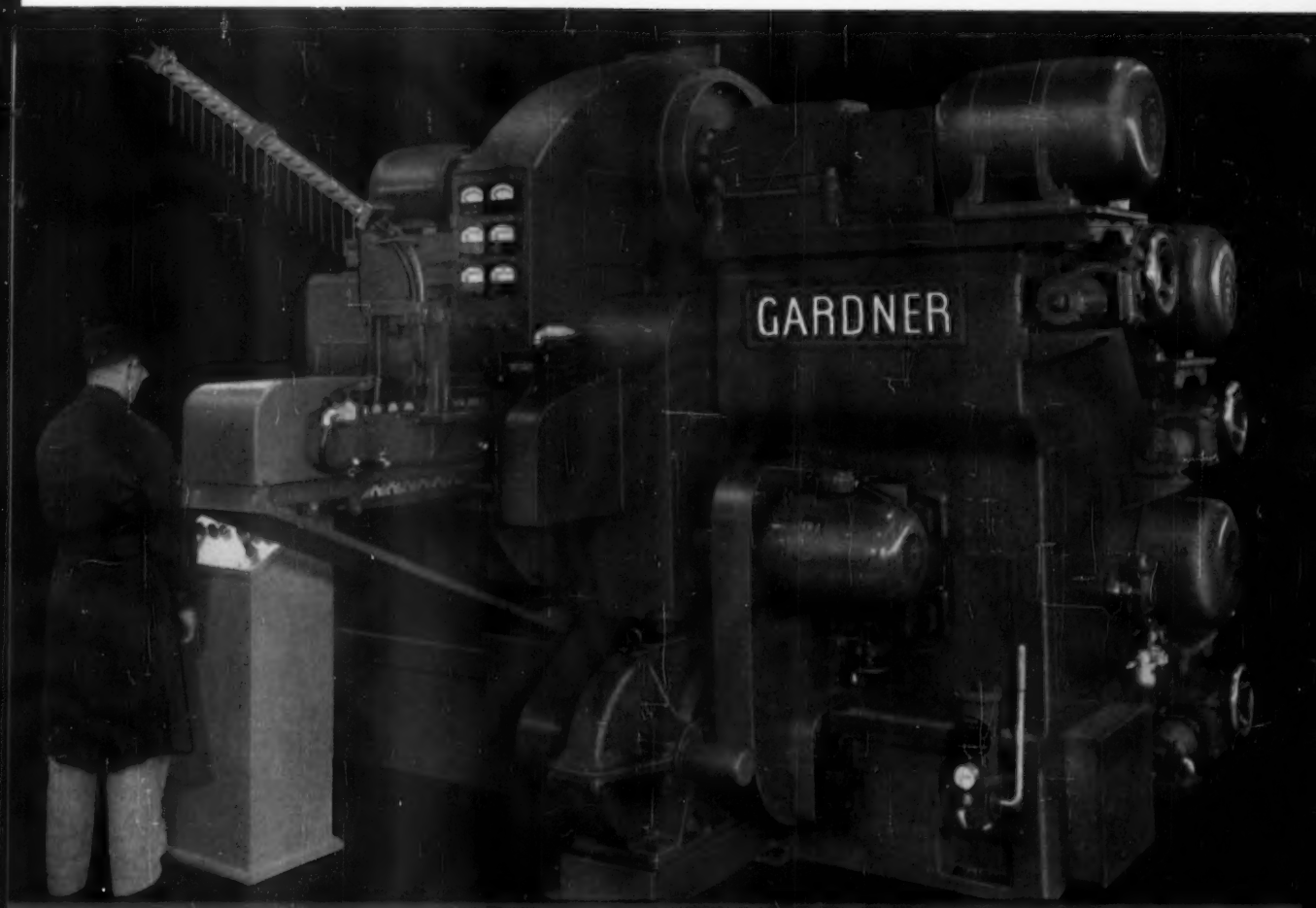
Designed for panel mounting where remote indication is required, this electrically operated counter is a compact package 5.5″ long, 2.1″ wide, 2.7″ high. Capacity: 1,000 counts per minute. Power consumption, 8 watts. Stocked in 110 and 220 AC and DC. Easy to reset, except when locked . . . then the sturdy tumbler-lock* puts the damper on tampering. Yet one turn of the key resets all 6 figures to zeros.

This new Magnetic Counter is one of the thousands of Veeder-Root standard and special counters . . . electrically, mechanically and manually operated . . . in daily use throughout the world in industry, business, science and medicine. You, too, can count on Veeder-Root . . . to help you count anything you need.

*National Lock Co. Lock No. 68-4837, Key D-428

Stocked at
Hartford 2, Conn. • New York 19, N. Y.
Greenville, S. C. • Chicago 6, Ill.
Montreal 2, Canada
Offices and Agents in Principal Cities

VEEDER-ROOT
"THE NAME THAT COUNTS"



GARDNER AUTOMATION grinds a valve every 2 seconds

Job Data

MACHINE Gardner No. 178-A Six-Head Grinder.

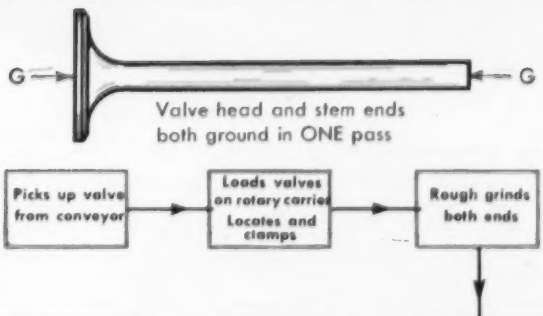
TOOLING Transfer conveyor automatically loads valves, an endless work-holding conveyor with vee-notched metal links and automatic clamping.

PART Automotive valve; alloy steel forging.

STOCK REMOVAL Approx. .070" overall.

TOLERANCES .0003" for squareness and .002" for uniformity on stem end.

ABRASIVES Gardner Yellow Rim WIRE-LOKT® Discs—three 23" discs on head end, three 18" discs on stem end.


G
G
Valve head and stem ends both ground in ONE pass
Picks up valve from conveyor
Loads valves on rotary carrier
Locates and clamps
Rough grinds both ends
Semi-finish grinds both ends
Finish grinds both ends
Discharges valves to conveyor

GARDNER

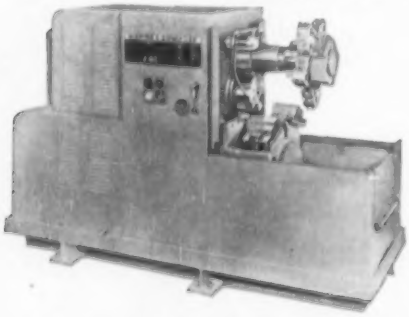
precision disc grinders

BELOIT, WISCONSIN

WARNER & SWASEY AUTOMATICS

slash machining time on 50 to 350 piece lots

1 AC CHUCKING MACHINE
8" or 10" Chuck — 6" Working Stroke



2 AC CHUCKING MACHINE
10" or 12" Chuck — 9" Working Stroke

THE YALE & TOWNE MANUFACTURING COMPANY, Philadelphia, machine 64,000 different parts, on a two-month cycle, for their five models of industrial lift trucks. They installed two Warner & Swasey 2 AC Single Spindle Automatics to step up production on a wide variety of small lot parts. Lot sizes range from 50 to 350 pieces.

They quickly realized the expected production increase, plus more efficient use of manpower, since one operator can easily handle both automatics.

They selected Warner & Swasey 2 AC's for the job because these machines give them the advantage of automatic production *without* the usual penalties of greatly

YOU CAN PRODUCE IT

increased setup time. Their setup time is just a small fraction more than on turret lathes.

"Another big advantage we had not fully anticipated," they report, "is the interchangeability of tools. The very accessible tooling area and the use of many standard turret lathe tools are valuable features of these automatics."

There are undoubtedly many small lot, "turret lathe" jobs in your own plant that could be machined faster, more profitably and with extreme accuracy on Warner & Swasey Single Spindle Automatics. Have your Warner & Swasey Field Representative show you how these machines' flexibility and fast setup can pay off for you.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

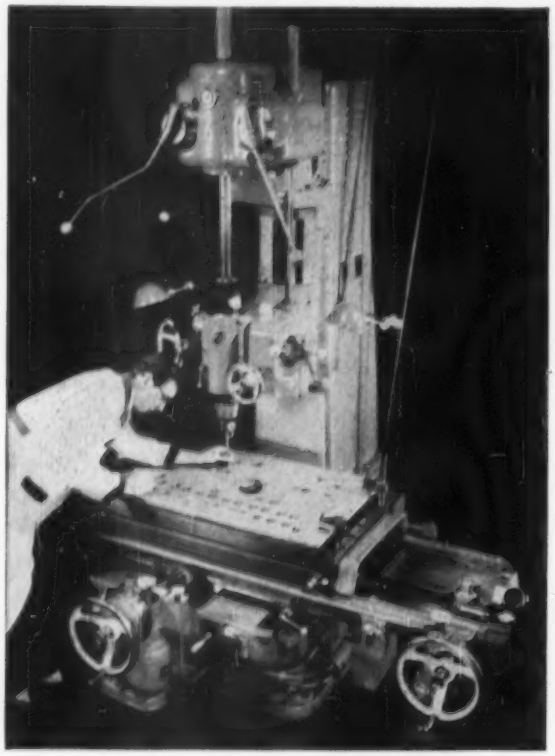
BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

BUY Precision THAT FITS...!

for tenths
YOU NEED A
CLEEREMAN JIG BORER

OR

for .001"/foot
YOU NEED A
LAYOUT DRILLING MACHINE



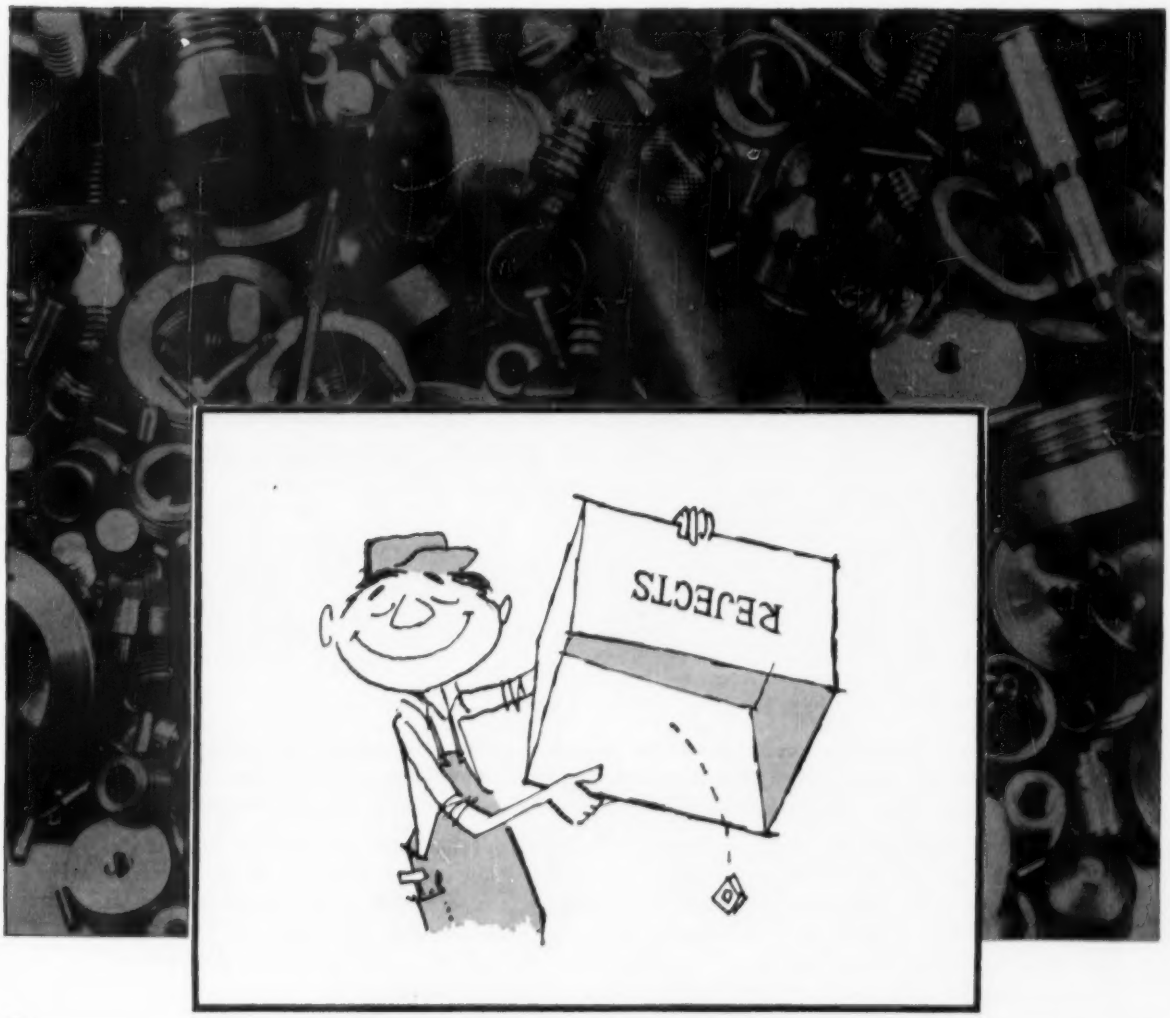
If your work involves gages, jigs, fixtures, or "jigless" production with ultra-fine tolerances, one of the three models of Cleereman Jig Borers is the answer.

But when your work calls for tolerances of .001" per foot, the economy of the Layout Drilling Machine is the "common sense" approach to your problem.

There are installations near you. Your Cleereman distributor can answer your questions and arrange an inspection visit for you.

BRYANT
Machinery & Engineering
• Company •
General Office
640 West Washington Blvd., Chicago 6
Representatives in Principal Cities

CLEEREMAN MACHINE TOOL CORP.
GREEN BAY, WISCONSIN



REJECTIONS dwindle to a new low when you start running on USS Free-Machining MX Steel.

It's a fact. Ever since this faster-cutting bar stock was developed, and in every shop where MX has been put to work, not only have more parts per hour been produced but they have been *better* parts. Better in finish, accurate in dimension, lower in cost—and with fewer rejects to cut into profits.

These highly desirable results are obtained with USS MX primarily because of its superior machinability, and also because this steel is consistently uniform in shipment after shipment. Uniform in cutting characteristics. Uniform in its composition and grain size. Uniform in freedom from defects and injurious imperfections.

Give USS MX a trial in your shop and watch production go up and costs come down. The performance of MX has been so universally superior that we feel sure that it will cut the cost of any part you now machine from ordinary screw stock.

USS Free-Machining MX is produced in both Bessemer and Open Hearth grades and is available in all the popular screw stock sizes. It is sold in cold-finished form by your regular supplier, either as "MX" or under his own identifying trade name. In hot-rolled form, MX is available through our nearest district sales office.

UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION
WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Bigger output... longer tool life... fewer rejects
—when you do the job with free-machining

MX

USS

UNITED STATES STEEL

you will get **CONTINUOUS**

in amazing volume from this

LAPOINTE

CONTINUOUS BROACHING MACHINE

With this Lapointe *Continuous Broaching* Machine, you can broach a wide variety of parts ranging in size from a tiny typewriter pawl to a jet engine blade. This machine is also being used for continuous broaching of automotive connecting rods and inverted spline gears.

BUILT HEAVY, to carry your heavy production load, this is the machine you need if you are mass-producing precision parts with contours or flat surfaces. Massive, sturdy, and with vibration eliminated, the obvious result is *smoothness of operation.* That means remarkable improvement in finish, decided increase in tool life. Built in 4 standard sizes: 10 hp. 42-inch stroke; 20 hp. 66-inch stroke; 30 hp. 90-inch stroke; 40 hp. 120-inch stroke. Any desired combination of horsepower, stroke, and speed can be obtained.

You are invited to write for detailed information on the Lapointe *Continuous Broaching* Machine, *"the machine that doesn't stop!"*

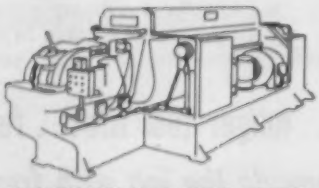
THE LAPOINTE MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

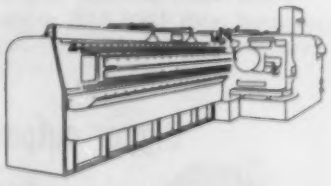
THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE

60" STROKE HORIZONTAL, ELECTRIC



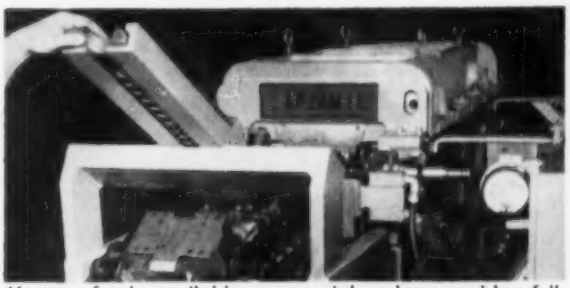
CH CONTINUOUS BROACHING, ELECTRIC



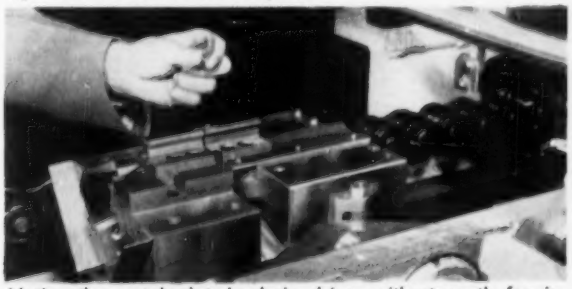
SRHE SINGLE RAM HORIZONTAL, ELECTRIC

PRODUCTION

with electro-motive drive

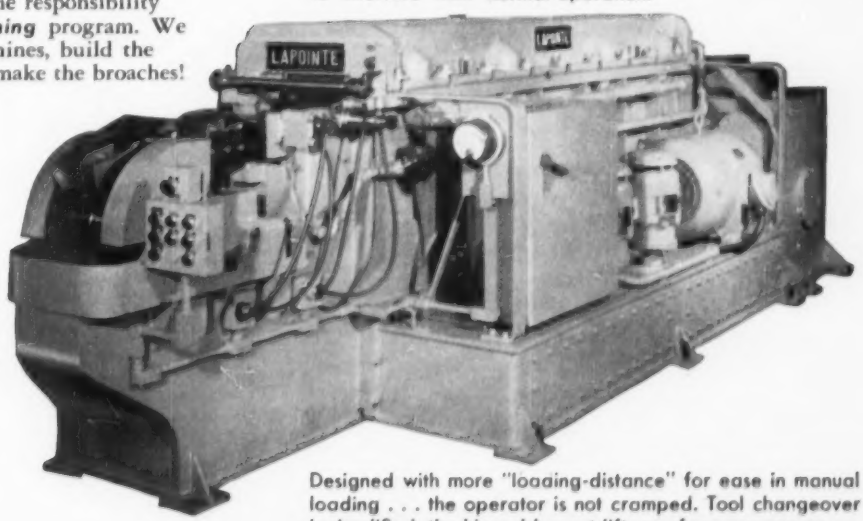


Hopper feed, available on special order, provides full automation. But even with manual loading the production rate is surprisingly high. (Broached parts are automatically ejected onto suitable conveyor).

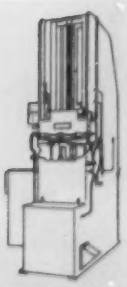


Notice the matched twin-chain drive, with strength far in excess of that required. The machine is completely fool-proof . . . it stops automatically if anything should occur to interfere with normal operation.

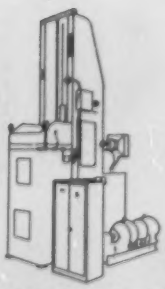
LAPOINTE takes all the responsibility for your ***continuous broaching*** program. We build the broaching machines, build the broaching fixtures, and make the broaches!



Designed with more "loading-distance" for ease in manual loading . . . the operator is not cramped. Tool changeover is simplified: the hinged bonnet lifts up, for easy access.



VUE-7 VERTICAL PULL-UP ELECTRIC



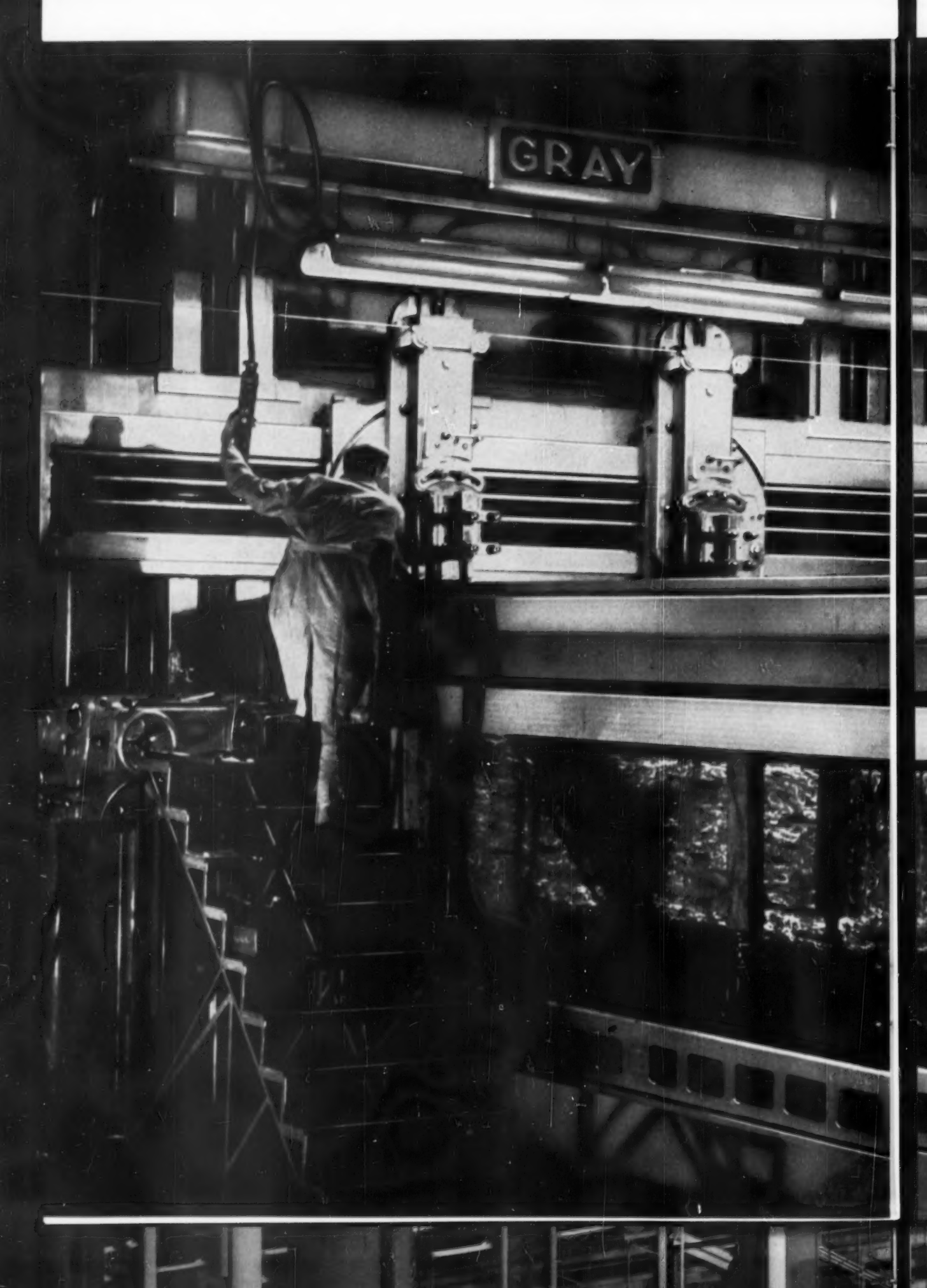
SRVE SINGLE RAM VERTICAL, ELECTRIC

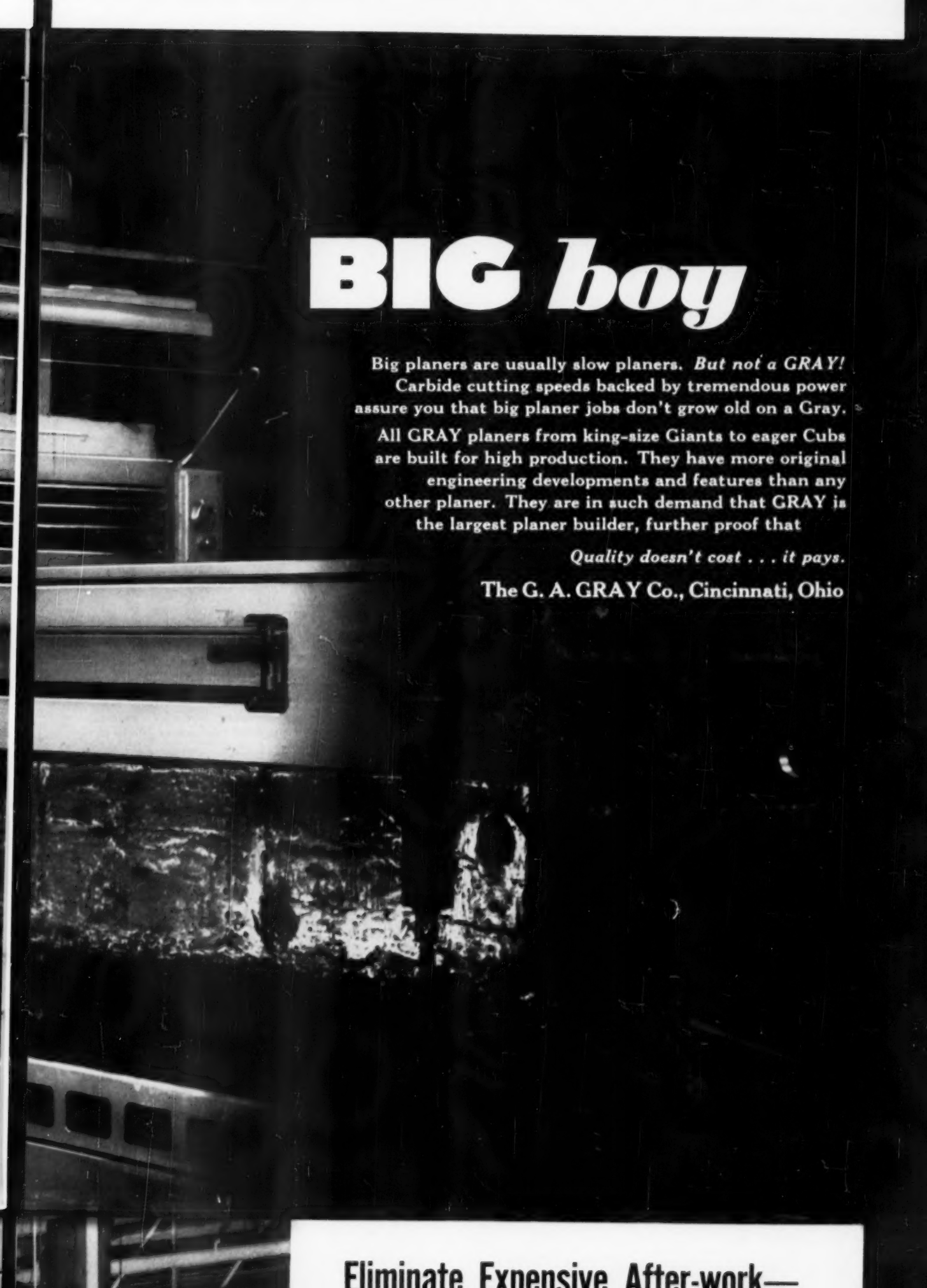
DRVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE

known to be the best in

BROACHING


GRAY



BIG *boy*

Big planers are usually slow planers. *But not a GRAY!* Carbide cutting speeds backed by tremendous power assure you that big planer jobs don't grow old on a Gray.

All GRAY planers from king-size Giants to eager Cubs are built for high production. They have more original engineering developments and features than any other planer. They are in such demand that GRAY is the largest planer builder, further proof that

Quality doesn't cost . . . it pays.

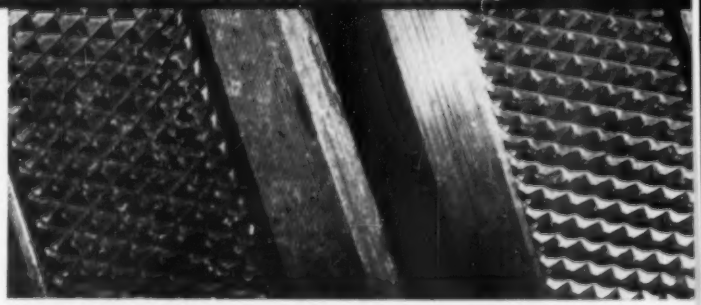
The G. A. GRAY Co., Cincinnati, Ohio

Eliminate Expensive After-work—

DIFFERENT COMPOSITIONS of G-E Neutralene gas are possible to fit various applications—annealing, hardening, brazing, sintering, and carburizing. G-E gas producers shown are rated at 15,000 CFH; complete line includes ratings from 200 CFH.

CAPSULE CASE HISTORIES SHOW BENEFITS OF USING PROTECTIVE ATMOSPHERES

OXIDES REDUCED when parts are bright annealed in Exalene gas. Pan on left is shown before cleaning; center pan, after pickling only; pan on right, after bright annealing only. Exalene gas is used also in normalizing, hardening, brazing, and sintering.

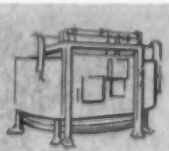


SCALE-FREE UNPITTED drill chuck on right was hardened in Thermalene atmosphere, does not need subsequent cleaning; chuck on left was hardened in air. Thermalene gas is used also in bright annealing, normalizing, brazing, sintering, and carburizing.

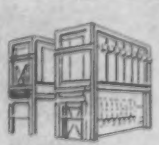
GENERAL ELECTRIC SELLS A COMPLETE LINE OF INDUSTRIAL FURNACES

Box

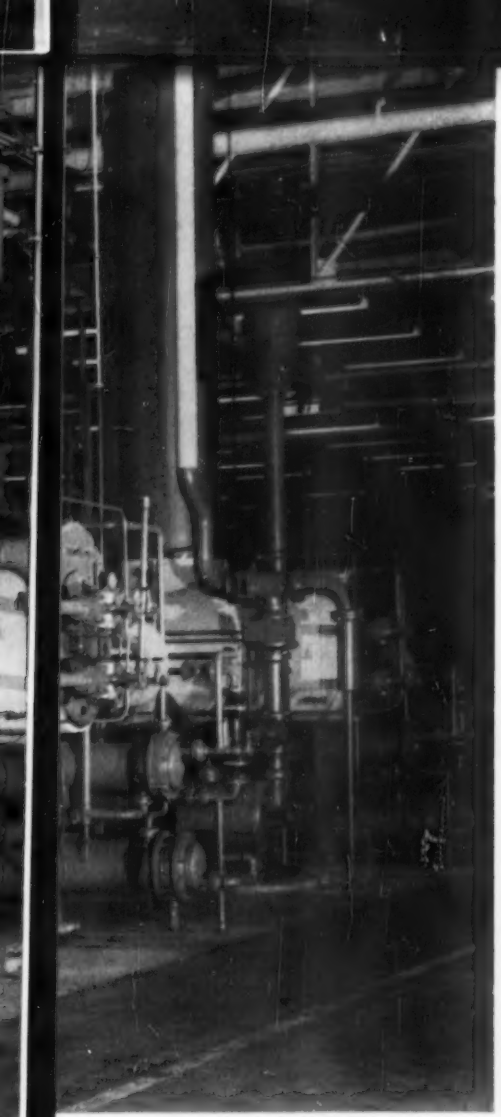
Cylindrical Pit



Rotary Hearth



Elevator



Eliminate Expensive After-work— Produce Clean Heat-treated Parts with G-E Protective Atmospheres

Protective atmospheres help you turn out heat-treated parts that are free from scale or oxides. They enable you to turn out a more salable product . . . at lower cost. This is true because pickling, grinding, machining, sandblasting, and similar operations are often made unnecessary.

General Electric offers various types and sizes of gas producers that let you manufacture atmospheres inexpensively—right in your own plant. You can prepare these atmospheres to provide exactly the right quality protection for your particular process. G-E protective atmospheres include: Exalene, an exothermic gas; Neutralene*, a CO_2-free, dry, exothermic gas; Thermalene*, an endothermic gas; Ammalene, dissociated ammonia.

Check these benefits of using protective atmospheres:

PREVENTING OXIDATION of metal surfaces during furnace heating is a primary advantage of protective atmospheres. Parts are produced at less cost and in a shorter total time cycle when scale formation is eliminated.

REDUCING OXIDES which have already formed is easily done by heating in a furnace supplied with the proper protective atmosphere. This reducing, or cleaning, is often used to prepare steel for porcelain enameling, galvanizing, or for furnace brazing.

CONTROLLING SURFACE COMPOSITION of metals in such operations as carburizing, nitriding, and prevention of decarburizing requires closely controlled furnace atmospheres.

ACCESSORY EQUIPMENT to meet specific needs is available:

Sulfur Removers take out sulfur dioxide and hydrogen sulfide where sulfur might harm the work or the furnace.

Regenerative-type Dryers remove moisture from gases. Can be had with closed-system reactivation for high-purity uses.

Refrigerated Gas Coolers remove some of the moisture from gases. These coolers may be used with regenerative-type dryers to reduce costs of preparing gases with low dew points.

COMPLETE SERVICES of your local G-E Apparatus Sales Representative include helping you to choose the most effective furnace atmosphere for your particular application . . . and to do it at lowest cost. Call him or send in coupon below for free descriptive bulletin.

*Reg. Trade-mark of General Electric Co.

GENERAL ELECTRIC

CLEANING ELIMINATED when stainless steel parts are brazed in Ammalene gas. Right-hand part is shown as it came from the brazing furnace—bright and clean.

FREE BULLETIN

Section E721-7
General Electric Company
Schenectady 5, N. Y.

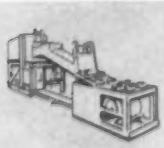
Please send me a copy of your bulletin, Protective Atmospheres, GEA-5907.

NAME .....

COMPANY .....

ADDRESS .....

CITY ..... STATE .....



Mesh Belt

Tower

Cylindrical Belt

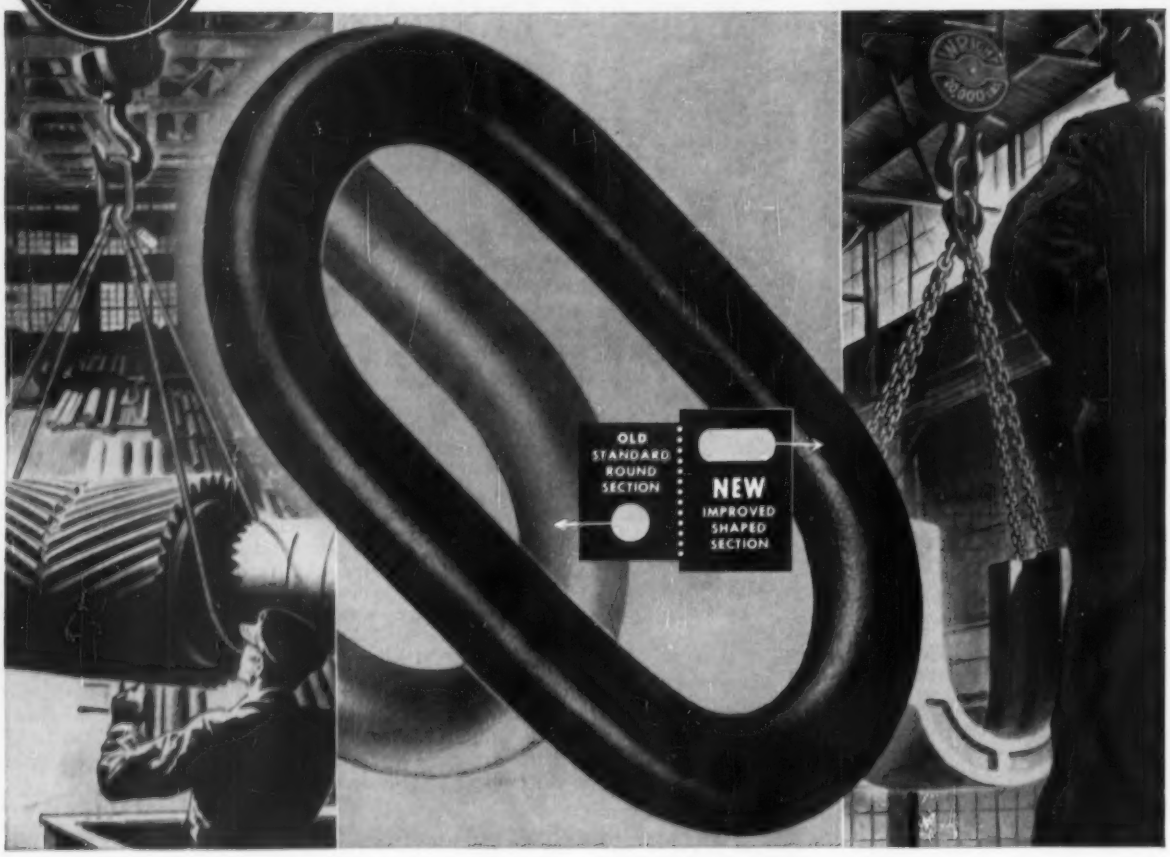
Roller Hearth

Continuous Conveyor

ACCO products

ACCO Registered* Slings–Wire Rope & Chain

THE STANDARD OF EFFICIENCY AND SAFETY



An Extra Bonus of Safety for Slings—
THIS NEW SHAPED MASTER LINK

• ACCO's engineers found that if they shaped the master links for chain and wire rope slings as shown above, these new shaped links would hold their form under loads up to 18% greater than could the old standard round links. The reasons are similar to those which enable a shaped I-Beam to handle greater loads than could the same amount of steel if used as a solid beam.

The new link is smoother and provides a greater factor of safety. It is a better link in many ways. It costs us more to make. Yet it is offered at no increase in price.

"Registered*"—for Greater Safety

Development of this new link is just the latest step in ACCO's continuing program to provide the greatest possible measure of safety and reliability in ACCO *Registered* Slings.

Each component of an ACCO *Registered* Sling is made from the best materials procurable for its use. Each part must prove to have strength equal to or greater than the sling body. All hooks for ACCO *Registered* Slings are Magnaflux tested. Then these components are assembled into slings according to carefully engineered designs that have proved themselves in rigorous field tests.

The completed sling is then individually proof-tested to twice the working load limit for which it is rated. Then, and only then, is it awarded the coveted ACCO Registration Certificate and the identifying ring or tag.

See your Distributor

ACCO *Registered* Slings are readily available from a distributor near you. If you don't know him write to our Bridgeport office for his name.

*Trade Mark Registered

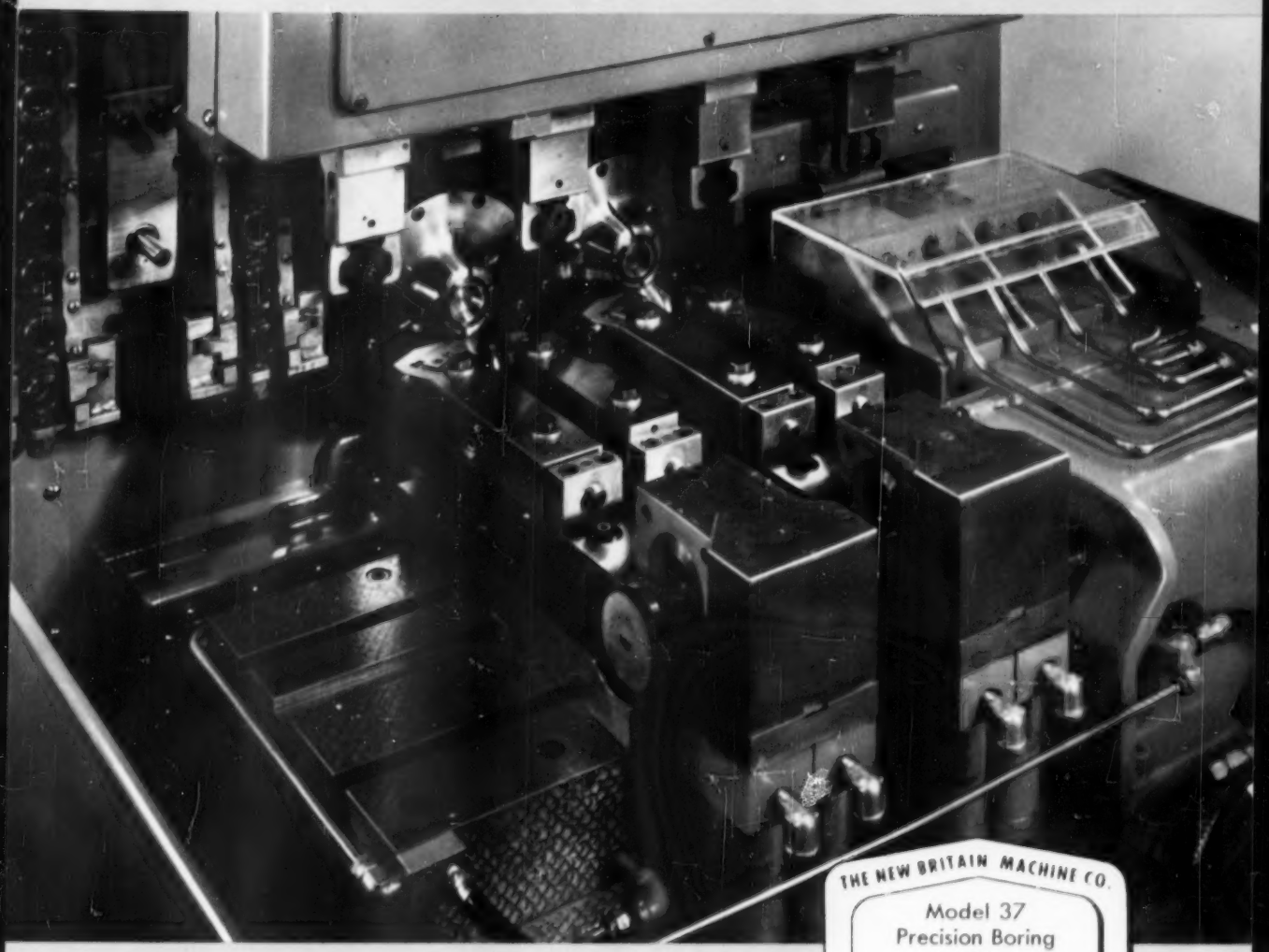
ACCO

AMERICAN CHAIN & CABLE

BRIDGEPORT, CONN.

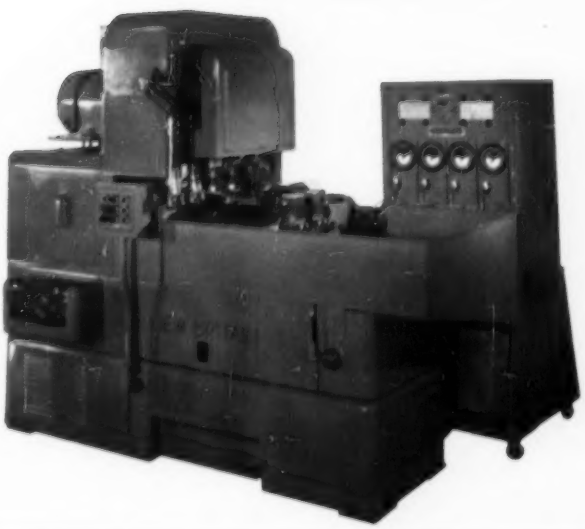
Atlanta, Boston, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Wilkes-Barre, Pa., York, Pa.
In Canada: Dominion Chain Co., Ltd., Niagara Falls, Ont.

Better Value



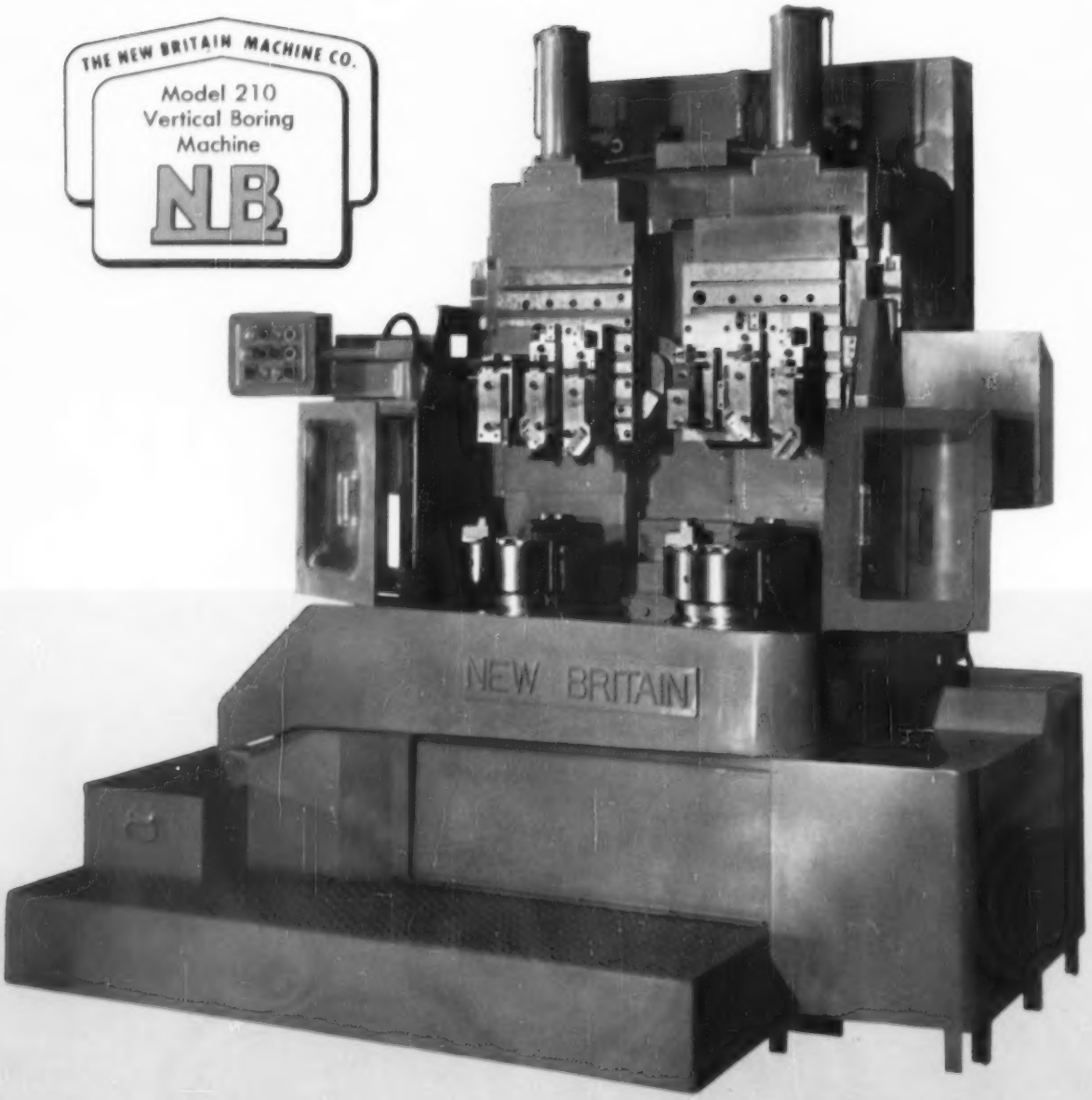
this is the boring machine that thinks

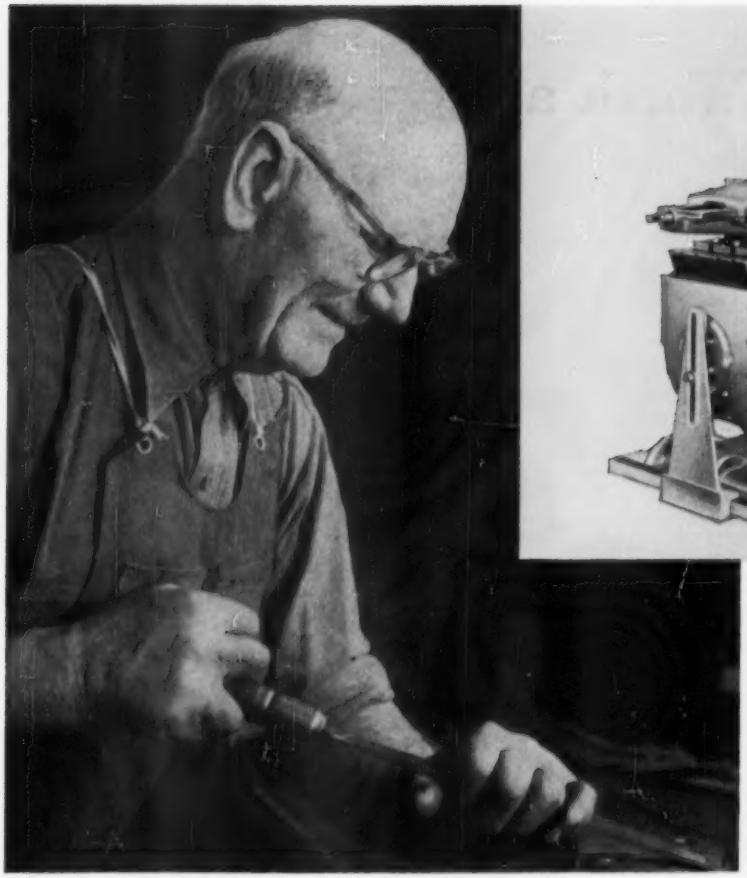
As successive pieces approach the limits of a ±.00025 inch tolerance, the tools reset themselves to size. With automatic loading, automatic gaging and two-at-a-time production, this and other New Britain Precision Boring Machines can cut costs for you. Please turn the page for more about New Britain Boring Machines.



verticals too!

New Britain builds a complete line of straight and contour boring machines, including double-end models, and this Vertical Precision Boring Machine for contouring and turning large parts to close tolerances. More and more the New Britain Sales Representative is your best bet for new and progressive metal-working methods. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.





VMA Universal Shaper Model ES-26

UTOMORDENTLIG YRKESSKICKLIGHET

(SUPERB CRAFTSMANSHIP)

VMA SHAPERS - built by Sweden's master craftsmen - are engineered to maintain precise tolerances in continuous heavy-duty production. Built to U. S. standards, VMA Shapers—both heavy duty and standard models — meet all requirements for modern versatile machines.

VMA Model ES Heavy Duty Shapers, available in Plain and Universal Models and with 18", 22", 26", and 28" stroke, feature:

- Wide selection of ram speeds and power feeds
- Automatic forced lubrication system
- Horizontal power rapid traverse of table through independent motor
- Double helical crank gear
- Chrome nickel steel transmission
- Anti-friction bearings throughout
- Dependable safety clutch

VMA Model EV Series . . . economical standard-duty Shapers with stroke lengths from 14" to 24".

- Highly accurate and dependable, Model EV Shapers are ideal for job shop or tool room use not requiring the extra power of the ES Series. Easy to operate — economical to own.

austin

INDUSTRIAL CORPORATION

76-F MAMARONECK AVENUE • WHITE PLAINS, NEW YORK

Every Feature Worth a Close, Close Look!

You're Right There! No stretch, no reach, no awkward lifting. Lathe has clean, close front with spindle right under hands.

Why Fight Chips? Bedway design provides chutes to empty chips into open pan at rear of lathe. Simple, practical, time-saving.

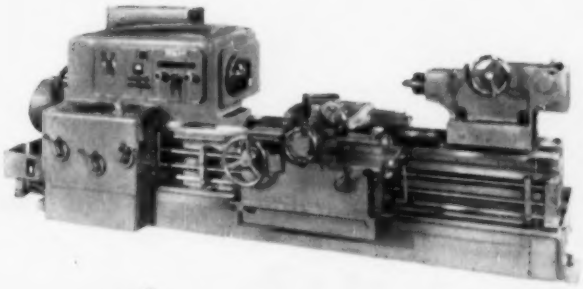
Headstock With a Brain! Dial work diameter setting and surface cutting speed setting. Dyna-Shift headstock *automatically calculates* required spindle speed and shifts to it hydraulically. No mental gymnastics — no compromise speeds!

Two for One. When turning medium steel, 1 cubic inch of metal removal per motor horsepower has been considered good performance. On the Series 80 you can raise that to over 2 cubic inches per motor horsepower.

Support Without a Thought. On longer bed lathes, the leadscrew, feed and control rods are continually supported by traveling carriers that are automatically picked up and dropped off by apron movement.

Infinitely Variable — Infinitely Effective. *Variable speed* four-way hydraulic rapid traverse of carriage and cross slide brings tool to work at the rate of travel you choose—does away with final manual positioning.

The Monarch Series 80 DYNA-SHIFT... The New Look in Heavy-Duty Lathes



MONARCH SERIES 80 DYNA-SHIFT LATHE, 36 Spindle Speeds. Headstock Ratio—125 to 1.

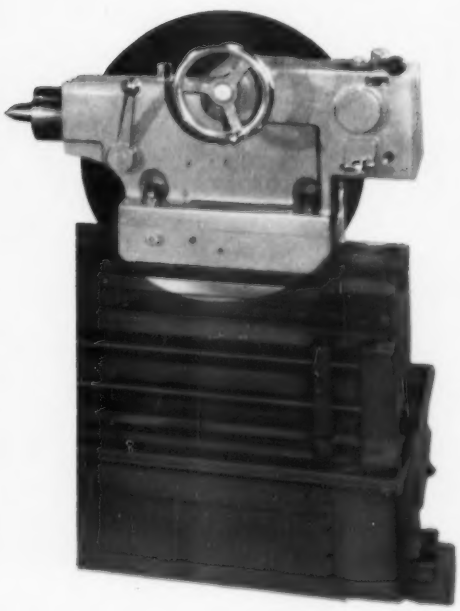
Models 1600 and 1601. Clearance diameter 26″ and 30″. Swing over cross slide 16″ and 20″. Speed Range 10-1250 RPM.

Models 2000 and 2001. Clearance diameter 32″ and 36″. Swing over cross slide 20″ and 24″. Speed range 8-1000 RPM.

Nimble Tailstock. Two speed range spindle movement — *power positioning* provided by engaging plunger on carriage and using longitudinal power rapid traverse.

Here's the lathe that's the talk of the shop and front office alike! The new Monarch Series 80 Dyna-Shift provides a completely new approach to the problem of heavy-duty metal turning —and the results are a rate of metal removal beyond the reach of previous designs; plus added production caused by the many exclusive, new built-in conveniences.

A look at just the few features pictured here tells why. Every one adds to the increased productivity and ease of operation of the machine. And there are so many more that we've prepared a complete, illustrated booklet to tell you about them. For full information on the lathe that gives you ultimate proficiency in the use of carbide tooling on work of considerable size—send for our Booklet #1602 . . . . . **The Monarch Machine Tool Company, Sidney, Ohio.**



Monarch
TURNING MACHINES

Clip this coupon to Your Letterhead for Complete Dyna-Shift Booklet

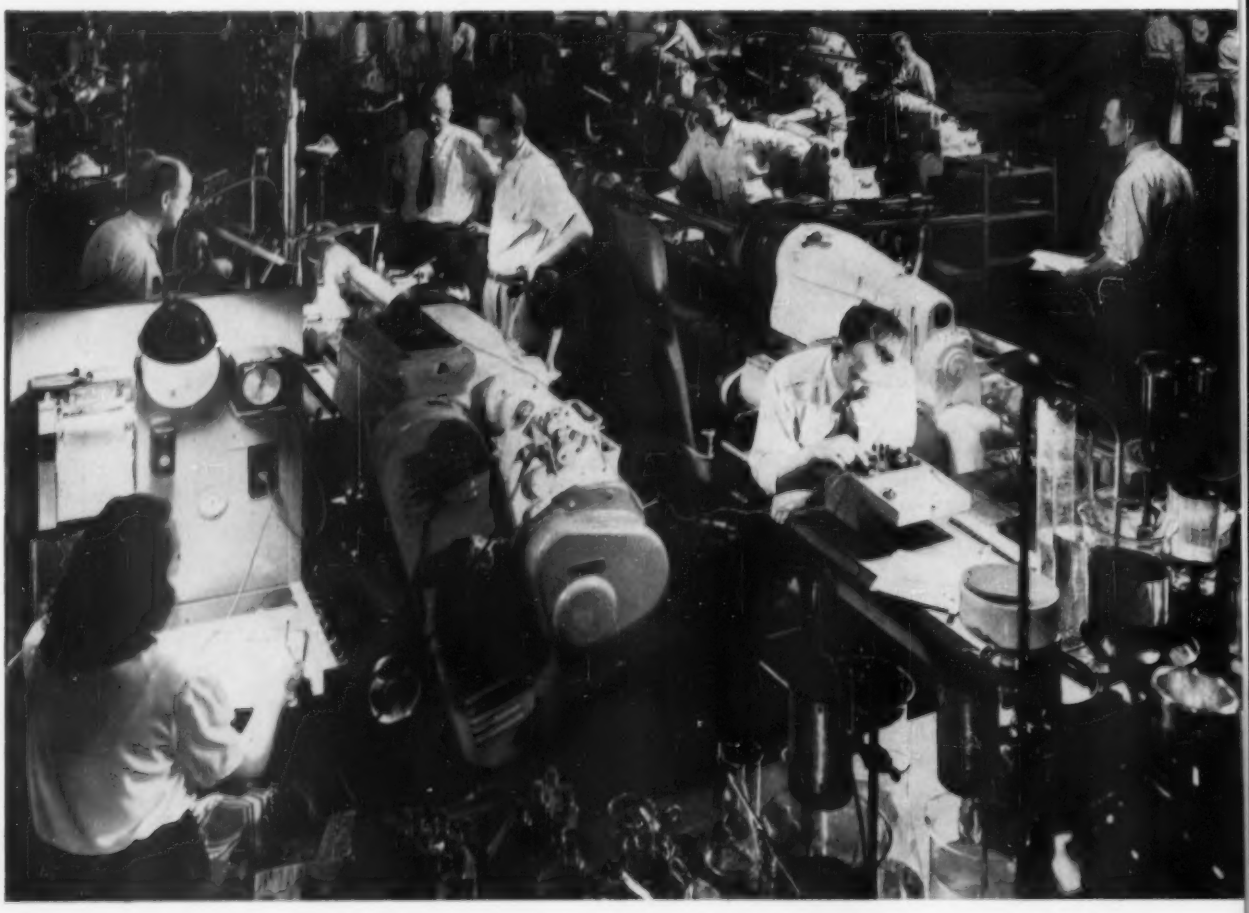
MONARCH MACHINE TOOL COMPANY
Sidney, Ohio

Please send me your illustrated booklet #1602 describing the Series 80 Dyna-Shift Lathe.

NAME_____

TITLE_____

Pour savings with **GULFCUT**



Here is a part of the modern machine shop in Gulf's extensive laboratories at Harmarville, Pa., where Gulfcut cutting oils are thoroughly tested and proved in actual shop service.

THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

into your shop

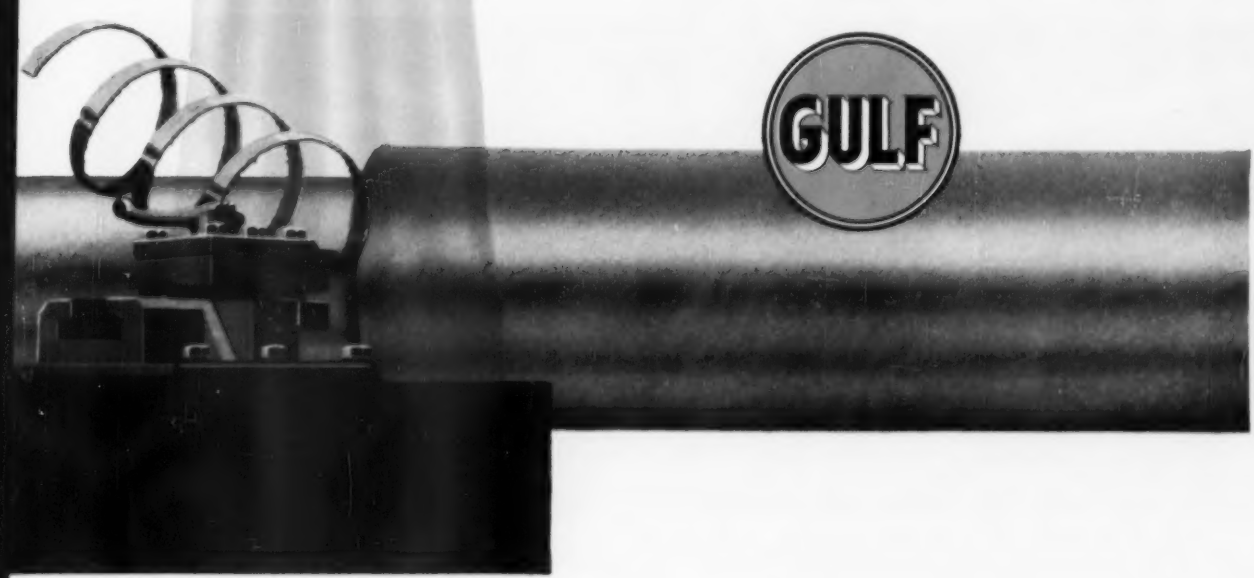
CUTTING OILS

Gulfcut is the new brand name for Gulf's complete line of modern, up-to-date cutting fluids. Each Gulfcut oil is scientifically compounded to meet the most exacting requirements for tool life, accuracy of work, and surface finish.

This new line of Gulfcut Oils includes mineral-lard oils, sulfurized-mineral oils, sulfurized-mineral lard oils, sulfo-chlorinated-lard oils, and emulsifying oils—outstanding cutting oils that contribute to better results in every metal cutting operation.

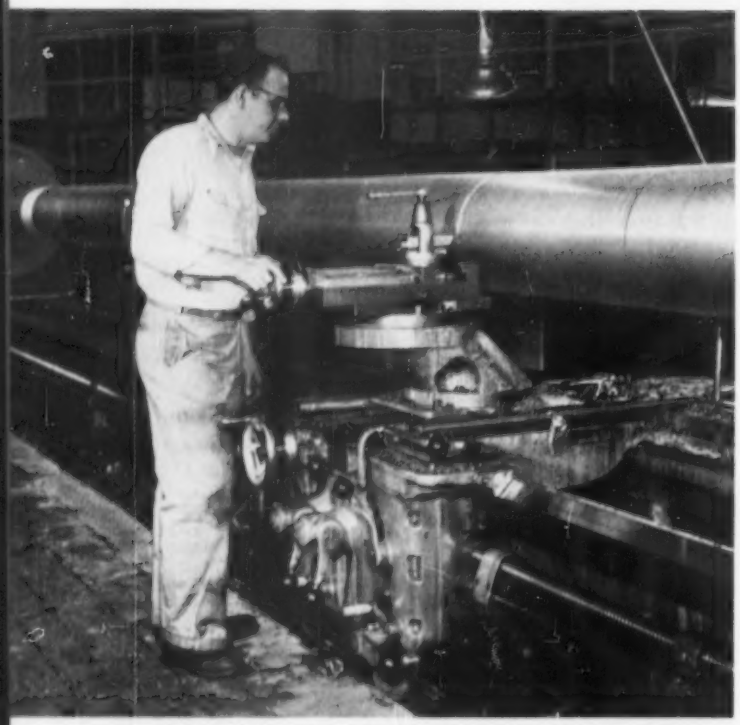
Have a Gulf Sales Engineer show you how one or more of the Gulfcut line of cutting oils can help you get increased tool life and lower machining costs in your shop. Consult the telephone directory for the number of your local Gulf office.

Gulf Oil Corporation • Gulf Refining Company
1822 Gulf Building, Pittsburgh 30, Pa.



AXELSON production

AXELSON MANUFACTURING COMPANY



GREATER SPEED AND FEED RANGES of the Axelson lathes plus rapid traverse and simple operator control were responsible for the production increase.

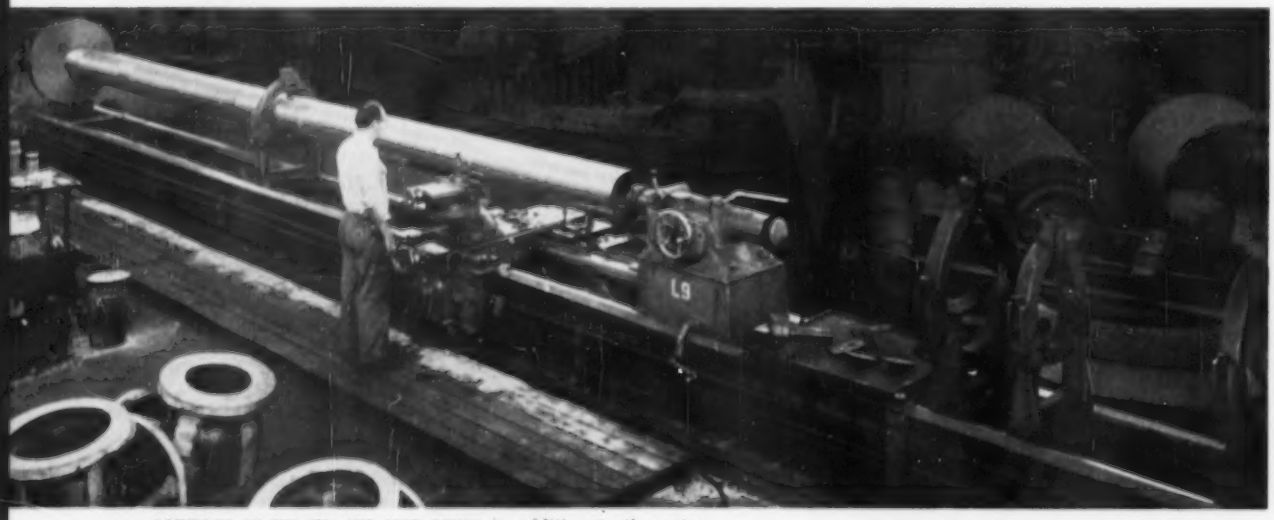
35% PRODUCTION INCREASE ON COLUMNS, TIE RODS, STROKE CONTROL RODS...

for giant presses at Lake Erie Engineering Corporation

Hydraulic forming and forging presses manufactured by Lake Erie Engineering Corporation, Buffalo, N. Y. range in size from 75 to 20,000 tons and have the ability to draw a bath tub or half a car body in a single stroke.

Columns, tie rods and stroke control rods for these four column giants are turned on Axelson lathes. Since these lathes were installed production has increased 35%, and accuracy of the end product greatly improved.

A typical job on the 46 foot bed 32" Axelson is a column rod 20" in diameter and 30 feet long. Operations include turning, threading, undercutting, facing and polishing. The column is a 1030-1050 carbon steel forging. Carboloy tooling is used. Turning time is 3 days.



ACCURACY OF THE BED AND LEAD SCREW in addition to the extreme rigidity of the Axelson lathes have significantly increased the accuracy of the end product.

and maintenance news

DIVISION OF U. S. INDUSTRIES, INC. / 6160 SOUTH BOYLE AVENUE, LOS ANGELES 58, CALIFORNIA

New 32" lathe features 81 standard feeds...simple selection of 45 different threads

To provide users with utmost flexibility in machining, the new Axelson 32" heavy-duty lathe has 81 feeds ranging from .005" to .351" per revolution of the spindle. Forty-five threads, from 1 to 30 per inch, are possible with the standard gear box.

By simple substitution of gears in the end train, odd threads or leads and ranges of metric module and diametrical pitches can be obtained. Two levers control the selection of feeds and leads. One lever divides the feed range into four groups. The second lever selects the feed or lead desired.

CONVENIENT CARRIAGE CONTROLS. All controls for operating the carriage are located on the apron convenient to the operator. Controls for both cross and longitudinal feeds are through easily operated drop levers which actuate serrated clutches to insure smooth operation and maximum power transmission. Longitudinal rapid traverse in either direction is controlled from the left side of the apron. Headstock control, to start, stop and reverse the spindle, is located on the right side of the apron.

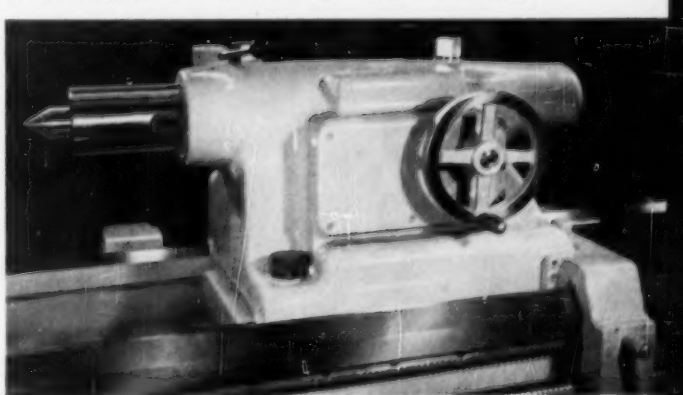
RIGID, TWO-SPEED TAILSTOCK. The two-speed tailstock provides a fast rate of movement where it is desirable to bring the tailstock center up to the work-piece as rapidly as possible; or a slow powerful movement of the spindle for feeding drills, reamers and other tools held in centers.

The new Axelson 32" lathe has many other outstanding features. For more information on it, the new 25/16 and other Axelson tool room, heavy-duty, sliding bed and hollow spindle lathes, write for catalogs A4-5507 and 5504.

AXELSON **Manufacturing Company**
Division of U. S. Industries, Inc.

TOTALLY ENCLOSED GEAR BOX. All gears run in continuous oil bath. Gears and shafts are mounted on anti-friction bearings for smooth, quiet operation.

VIBRATION-FREE CARRIAGE. Carriage locates on hardened steel front-way and rides on wide, flat hardened steel rear-way. Result is rigid, vibrationless turning on even heaviest jobs.



ONE-PIECE TAILSTOCK. Tailstock is rugged, one-piece design which transmits extreme tool loads to bed. Tailstock can be clamped to bed for extremely heavy jobs.

This CINCINNATI...

1½" thick x 12'

This 15012 Series Cincinnati All-Steel Shear has a 36" gap and a 48" back gauge range.

Power for heavy cutting with accuracy and operating convenience are combined in this machine.

Modern features such as—Hydraulic Holddowns, Front Operated Power Back Gauge, Hinged Back Gauge Angle, Automatic Pressure Lubrication, All-Steel Interlocked Construction, Forged Alloy Steel Eccentric Shaft—all contribute to an outstanding performance with low maintenance and high accuracy.

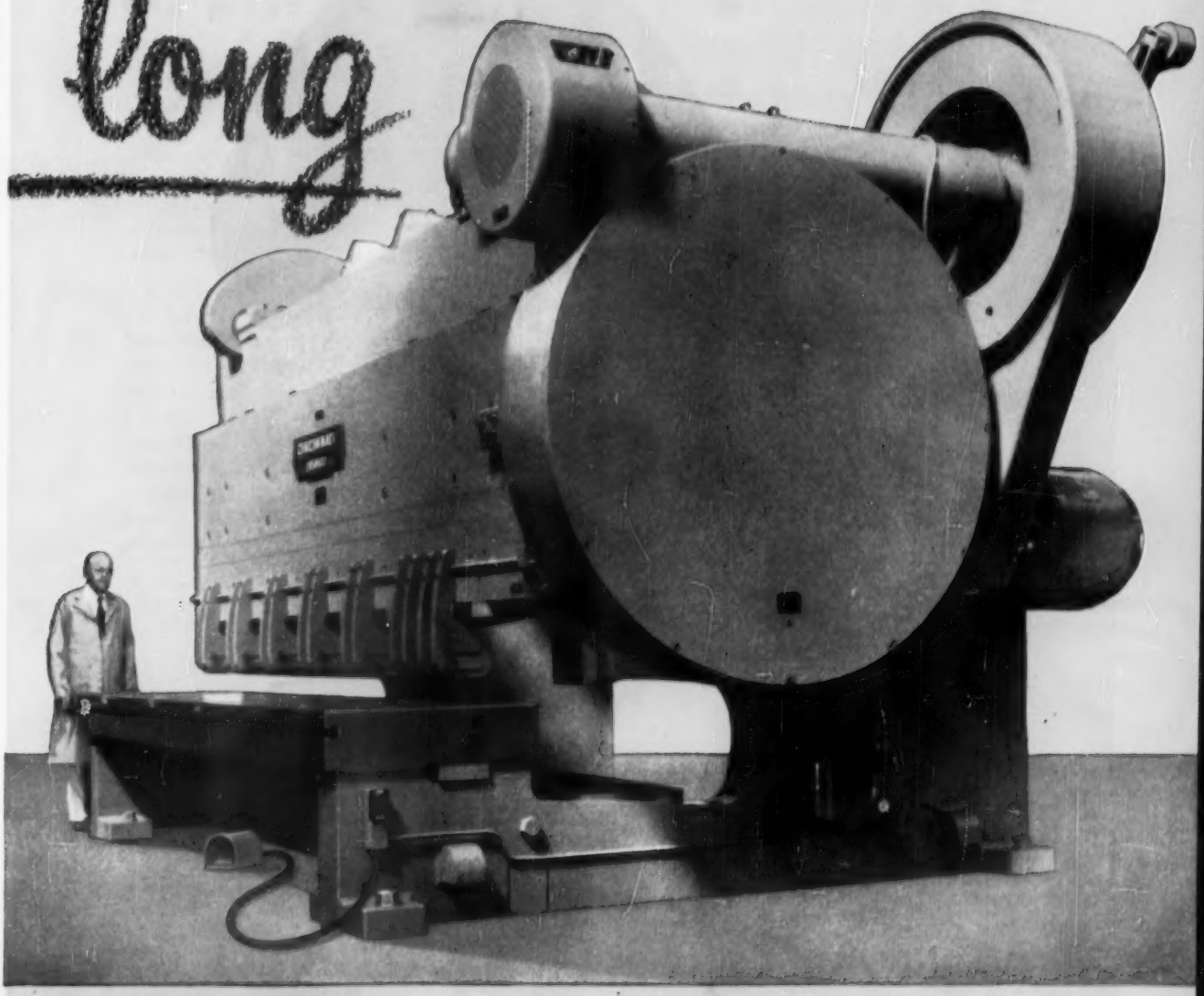
Write for Catalog S-7.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

shears steel plate

long



See your Cincinnati Representative for either Heavy or Light Shearing Applications.

Something more

than machining...

the most decisive factor of accuracy in a *Hendey* Tool and Gage-Makers' Lathe

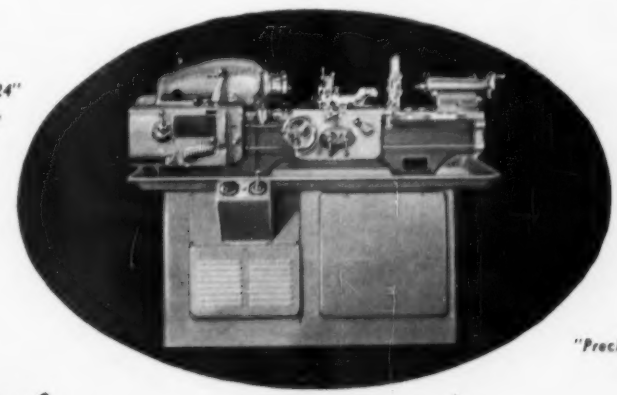
Pictured here is one of the many determining steps in the process of building a toolmakers' machine tool — the point at which craftsmanship takes over after the finest available machines and methods have done their job.

After precision grinding all of the way surfaces on a Hendey 9" Tool and Gage-Makers' Lathe, the operator uses this special fixture to check relative alignment and accuracy. "Tenth" indicators are first set by mounting the fixture on a "master." The "master," itself, has been hand scraped until its ways are within .0002 in. of each other and any other surface. Skillful use of the fixture permits the operator to hold straightness and parallelism of the hardened ways within precision tolerances.

This lathe can be equipped with either a magnetic amplifier or an electronic drive unit. Either of these drives makes turning easier than ever before. They give you a wide range of stepless speeds and close control of speeds, which can be changed smoothly and easily even under load. Production is speeded by a dynamic brake, which allows rapid stopping of the spindle. You can start, stop, and reverse the spindle from pre-set speeds smoothly and quickly . . . and brake maintenance is eliminated.

These are only a few of the reasons this toolroom lathe can help you improve accuracy, increase production, and reduce turning costs. Your Hendey dealer is ready to give you the complete story.

Hendey 9" x 24" Tool and Gage-Makers' Lathe



"Precision with Production"

Hendey machine division
BARBER-COLMAN COMPANY
41 LOOMIS ST., ROCKFORD, ILLINOIS

BARBER COLMAN ®

flexible

for drilling or reaming either 4 or 6 cylinder heads . . .

A leading tractor manufacturer asked us to design and build a single machine that would handle the drilling and reaming of both 4 and 6 cylinder heads for tractor engines.

HERE IS THE MACHINE . . .

BAUSH VERTICAL W-8 HYDRAULIC MULTIPLE SPINDLE DRILL with a 7-position tunnel-type fixture, for progressive working positions to drill and ream all sides of head. Fixture is equipped with air clamping and electrical interlocking.

Machine has a 28" x 54" rectangular fixed center head with a 2-speed geared yoke and has a master-bored cluster plate for 80 holes, furnished with 80 slip-sleeve adjustable joint driven spindles. By removing or inserting the ¼" to ⅝" tools in the proper spindles a quick changeover from 4 to 6 cylinder heads is made. Spindles are driven by a 30 H.P., 1800 RPM motor and hydraulic pump is driven by a 5 H.P., 1800 RPM motor.

BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

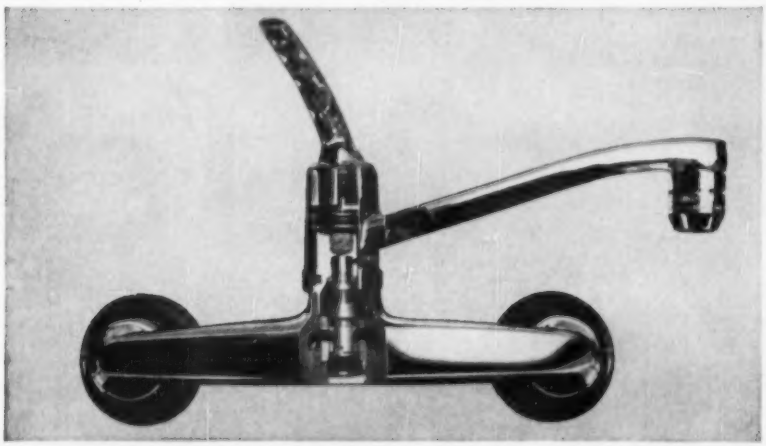
Why not send us your machine tool problems — let's look over your prints — there is no obligation. Wire, phone or write us.

BRIDGEPORT BRASS COMPANY

COPPER ALLOY BULLETIN

Bridgeport Brass Co.

Reporting new developments in copper-base alloys and metalworking methods.



Modern, Single-Handle Faucet Relies on Bridgeport Alloys for Precision-Fit Parts

A practical answer to scalded hands at the kitchen sink is the ingenious, precision Moen faucet made by Ravenna Metal Products Corporation, Seattle.

Replacing the traditional valve-and-washer system with a stem and ported-piston assembly, this faucet mixes hot and cold water to temperatures predetermined by the position of its single handle. Precision-fitted parts eliminate washers and assure watertight connections.

Recognizing that a simplified design often requires expert metallurgical and production knowledge to specify the proper materials, Ravenna asked Bridgeport Technical Service for assistance in materials selection.

This new faucet design placed double responsibility on the materials. All had to meet stringent machining requirements. Each finished part had extensive performance specifications. During test runs with conventional alloys, machining difficulties occurred. Then service failures developed, season-cracking among them.

Technical Service studies for Ravenna indicated that certain Bridgeport alloys, made to ASTM specifications with exact tempers and stress relief anneals, would meet all requirements. And, all machined parts could be made by straight machining on Ravenna's standard Warner & Swasey automatics.

For the spray, valve escutcheon and escutcheon nut, specifications stipulated the use of hard-temper Bridgeport Alloy T-64. Supplied in tube form, this high-leaded alloy is ideal for operations involving extensive machining.

For packing nut, spout end, brass body, body nuts, lock nut and jam nut, the specifications called for Ledrite 6 half-hard brass rod. This is a free-cutting alloy uniform in composition. It assures accurate dimensions and minimizes tool wear.

For spout tubing Bridgeport recommended light-drawn Alloy 69, a cartridge brass, highly ductile and well adapted to both cold-working and severe forming operations.

Radically different requirements were necessary for the anchor washer and discs. Here the studies recommended the use of Bridgeport F-3034 10% Phosphor Bronze D because its characteristics facilitated manufacturing and gave desired wear resistance.

In every instance, Ravenna has found that the alloy characteristics essential to manufacture also assure satisfactory service life in the finished product.

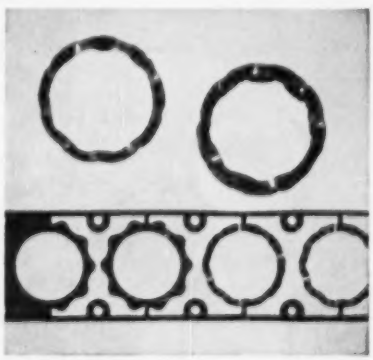
Whenever you plan to simplify or redesign your products, let Bridgeport Technical Service contribute its metallurgical studies and recommendations. This service, available from Bridgeport Sales Offices, can help you achieve manufacturing efficiency and product satisfaction.

Unique Ball Bearings Use Retainer Cages of Bridgeport Brass

Stephens-Adamson Manufacturing Company of Aurora, Illinois, produces the well-known Sealmaster ball bearing unit, widely used in mining, agriculture, textile and heavy-duty applications. Sealmaster bearings are designed to operate under severe atmospheric conditions with a minimum of maintenance.

Unique bearing cages accurately space the balls to distribute radial and thrust loads and at the same time trap and hold grease and prevent its churning. To make these retainer cages, Stephens-Adamson uses Bridgeport F-37 cartridge brass, soft, as recommended by Bridgeport Technical Service.

Smaller cages are made by progressive die operations. Larger cages are press-formed from blanked-out rings, the separate halves being riveted together.



Bridgeport Alloy F-37, developed primarily for the production of artillery shells and small arms cartridges, is a superior material for products which are deep-drawn, spun or progressively machined.

For Sealmaster bearings, Alloy F-37 is supplied in widths up to 9 inches. The easy working qualities of this Bridgeport alloy make it ideal for this application. In other cases, too, there is usually a preferable Bridgeport alloy. Technical Service can help you find it. A call to your nearest Bridgeport Sales Office will make all arrangements.

(4626)

Bridgeport Brass Co.

BRIDGEPORT BRASS COMPANY ◆ BRIDGEPORT, CONNECTICUT

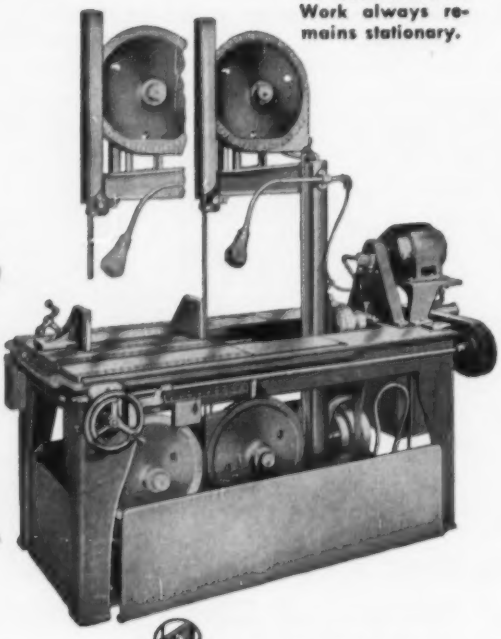
Mills at Bridgeport, Conn., Indianapolis, Ind., and Adrian, Mich. Sales Offices in Principal Cities—Conveniently Located Warehouses

Never Confuse the No. 8 MARVEL with an ordinary Band Saw

...only the MARVEL is Universal

Only on a MARVEL No. 8 does the blade remain at a right angle throughout its full 18" feed traverse. Work always remains stationary.

Only on a No. 8 MARVEL can the saw column be instantly indexed and locked at any angle from 45° right to 45° left, and the saw then fed thru the work at the desired angle — without moving the work.



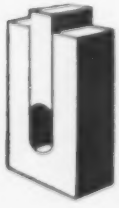
Only a No. 8 MARVEL can do all of these things: Snip-[illegible] a ⅛" rod or cut-off an 18" x 18" cross section

Rough to Size and Shape

Miter

Index

cut off and shape Structural Beams



Only a No. 8 MARVEL has the large T-slotted work table, with removable quick action vise, that permits accurate set-ups of work of unrestricted sizes and shapes, special fixtures; Etc.

"Rough Machine" to size and shape with minimun chip waste

The No. 8 MARVEL is the "busiest tool in the shop" wherever installed because it is a *universal* tool—has both the capacity and the versatility to handle not only standard sawing jobs but innumerable "trick" and convenience jobs as well. More than a metal saw, the No. 8 MARVEL is a fine machine tool with machine tool features like: Both power and hand feeds; Depth Stops; Automatic Blade Tension; Built-in Coolant Pump; Three operating speeds (or six with 2-speed motor). Moisture-proof electrical controls that conform to both "J.I.C." and "MACHINE TOOL" electrical standards; Dirt-proof ball bearings, etc.

If you cut, machine or fabricate metal, this is a sawing machine you should know about. Write for catalog.

MARVEL Metal Cutting SAWS

Better Machines–Better Blades

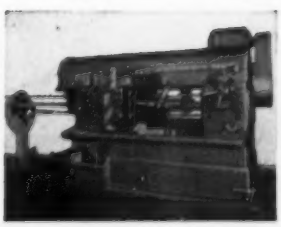
ARMSTRONG-BLUM MFG. CO. • 5700 West Bloomingdale Avenue • Chicago 39, U.S.A.

First with NEW "Automatic" Service

Cone was the first builder of multiple spindle automatics to provide machine users with an experimental service in the application of carbide tools.

This service is a practical means of determining the possibilities of carbide tools for production men without loss or interference with their regular production schedules.

A pamphlet "FOUR STEPS WITH CONE" describes this service. Send for your free copy.



Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.

Why the Die Maker Prefers PRODUCTO Die Sets

Volkert Stampings, Inc.

The die maker likes to work with Producto Die Sets

He knows Producto die sets are easy to assemble —especially those equipped with the unique new Qwik-Fit Guide Pins*.

He has confidence in the consistent accuracy of Producto sets. He has found that they always align his dies correctly.

He knows he can choose from a variety of thicknesses the Producto die set that meets the strength requirements of his die.

He favors Producto die sets because they are dependable. They will perform on the press as well as they did in tryout.

He likes the attractive, streamlined appearance of Producto sets. They make his dies look better and increase his pride in these products of his craftsmanship.

*Patent Pending

He knows that a nearby Producto warehouse can supply any catalog die set he needs...and that orders for specials are promptly processed. He can count on having the die set by the time he needs it.

The die maker has found that all of his requirements are met by Producto die sets. You will, too, when you place your order with Producto.

DIE SET DIGEST, our eight-page quarterly, contains valuable data for designers, makers and users of dies. Write to have your name added to mailing list.

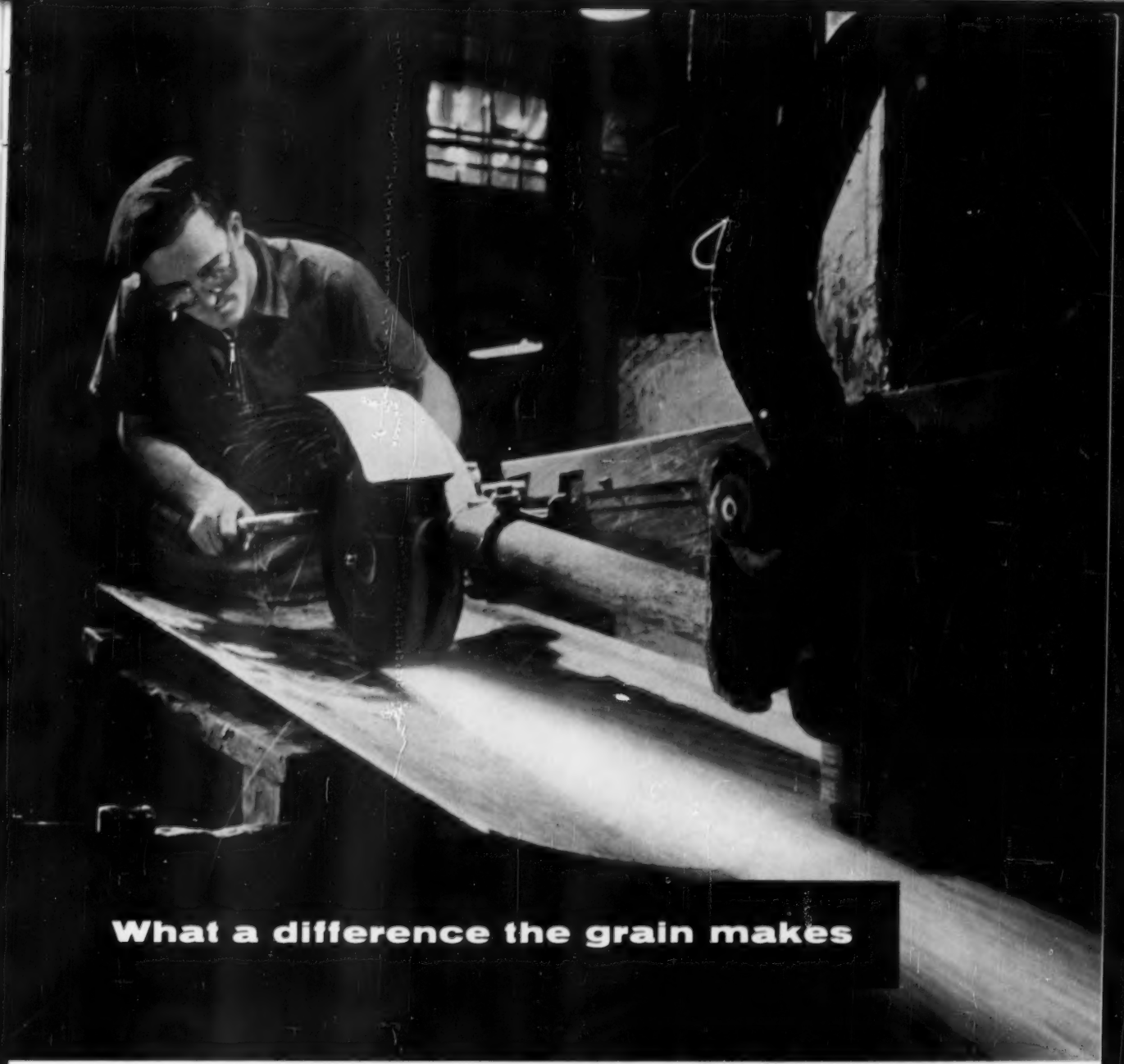
THE PRODUCTO MACHINE COMPANY
975 Housatonic Ave., Bridgeport 1, Connecticut

PRODUCTO

Wherever die sets are used

PRODUCTO

PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS



What a difference the grain makes

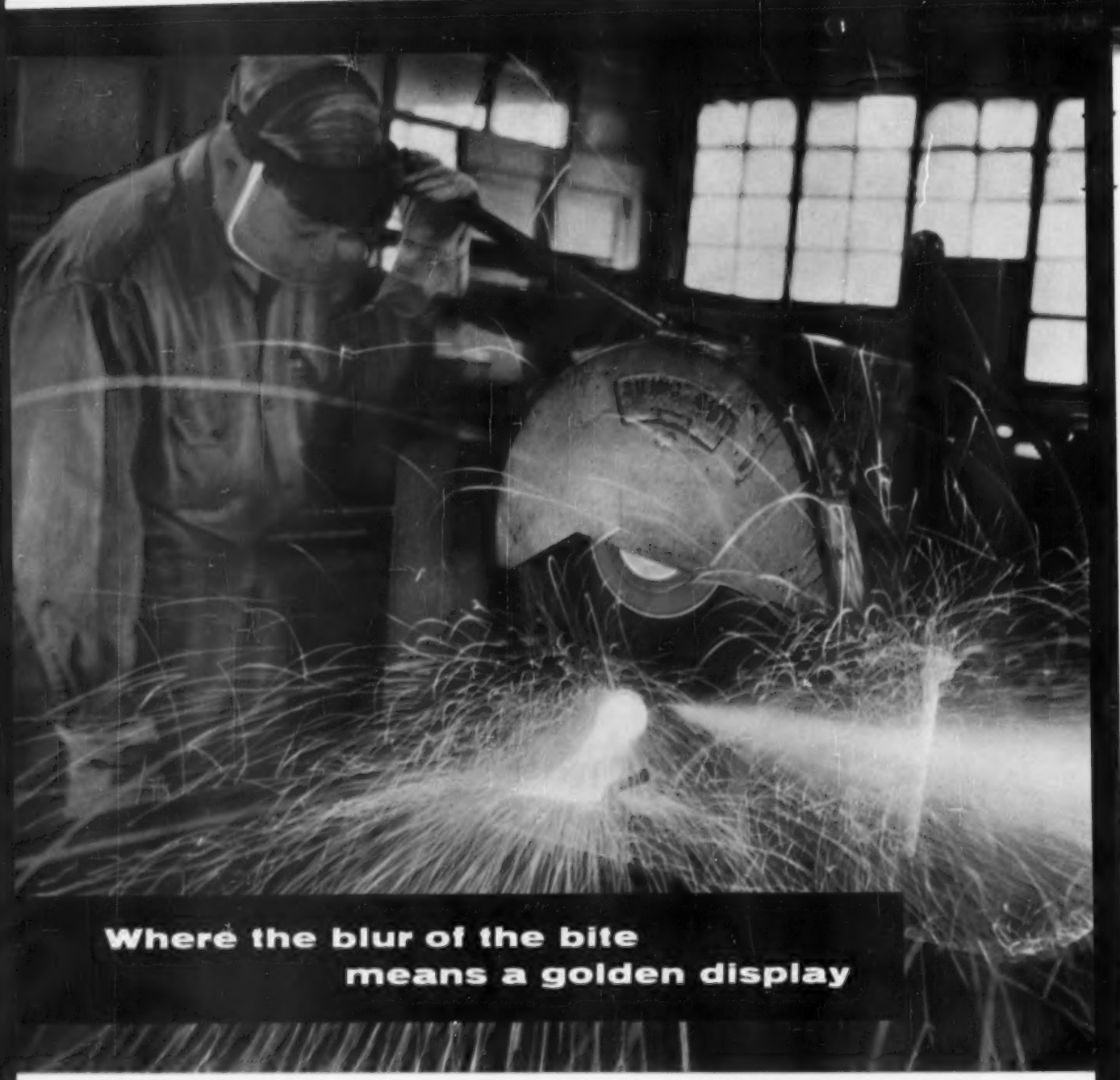
The *quality* of your metal polishing — whether high stock removal or fine finish — depends on the *quality* of the abrasive grain you use in setting up your polishing wheels. Abrasive grain and powder manufactured by CARBORUNDUM are engineered as precisely as any other production tool, accurately graded and continuously tested for flawless uniformity. As one of the world's largest producers of crudes and manufactured grain, CARBORUNDUM offers the widest choice of grain types. Whatever your job—there's a grain or powder made by CARBORUNDUM with the *exact* physical characteristics, in the correct grit size, to give you superior results at less cost. To help identify, select and use the *right* grain and powder, ask your CARBORUNDUM Distributor or salesman for Booklet 14. Or write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ontario.

Through application "know-how" and product quality

CARBORUNDUM

REGISTERED TRADE MARK

continually puts more sense in your abrasive dollar



Where the blur of the bite means a golden display

PHOTOGRAPHED AT DETREX CORP., DETROIT, MICH.

The shower of sparks tells you right away this wheel cuts faster! But that's only *one* feature of the revolutionary new B7 Bond Resinoid Cut-Off Wheel developed by CARBORUNDUM. *Want a faster cut, free from burr and burn?* B7, tested against ordinary wheels, gives it to you...with equal wheel life. *Want up to 25% longer wheel life?* B7 gives it to you...with equal quality of finish. No wonder B7 Bond Wheels are setting new standards of performance for abrasive cut-off... in production, close tolerance accuracy, economy! Have your CARBORUNDUM Distributor or salesman put a B7 blade on your chopper type machine, and see for yourself! For Bulletin A-1374 on B7 Bond Wheels, write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ontario.

Through application "know-how" and product quality

CARBORUNDUM

REGISTERED TRADE MARK

continually puts more sense in your abrasive dollar

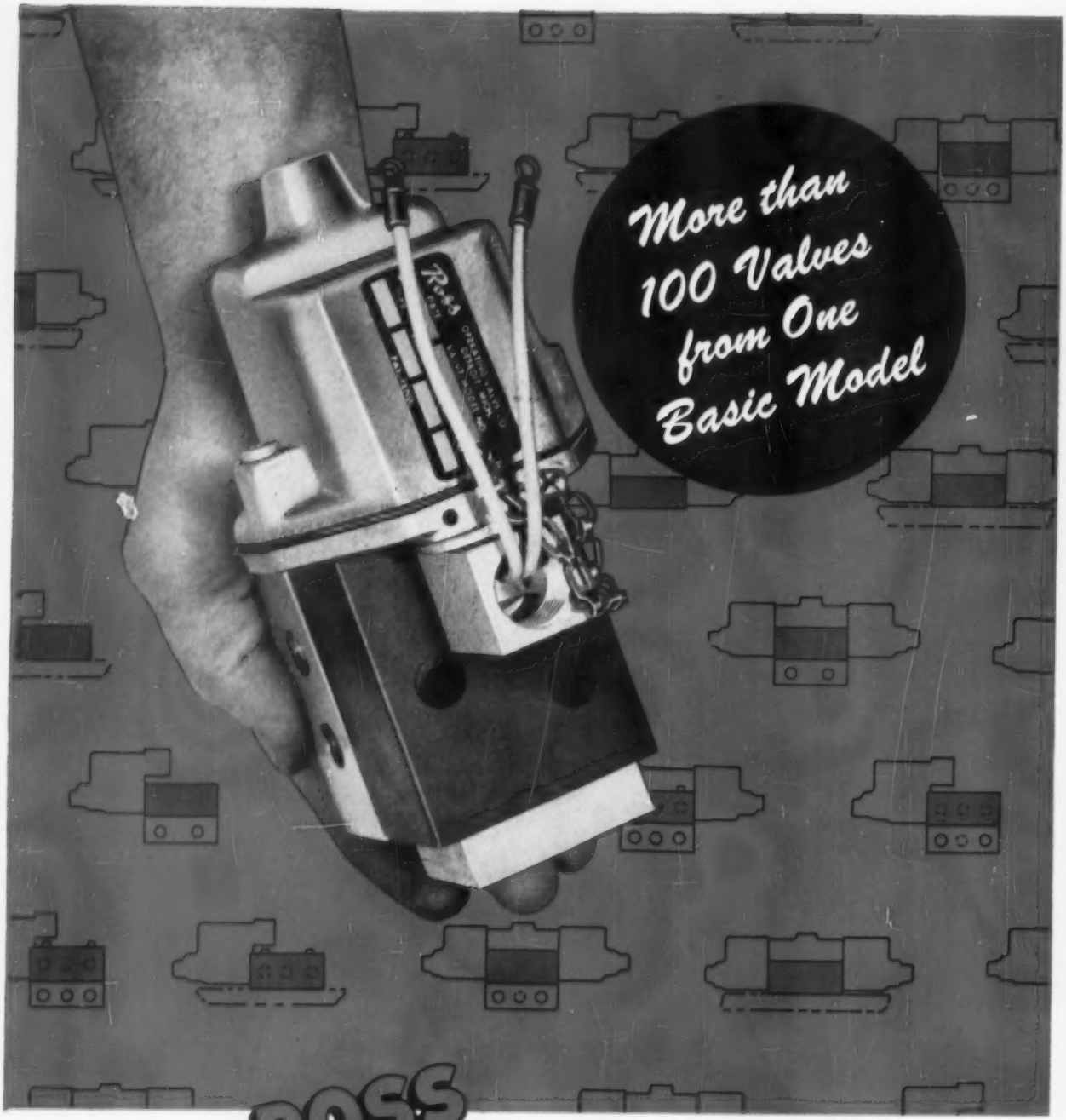
Why "foul up" your production with inferior gage inspection when you can get "Major League" performance for "extra innings" with Bath Reversible Plug Thread Gages.

If you're interested in a "no error game" — write for circular today.

JOHN BATH & CO., Inc.

22 Grafton St., Worcester, Mass.

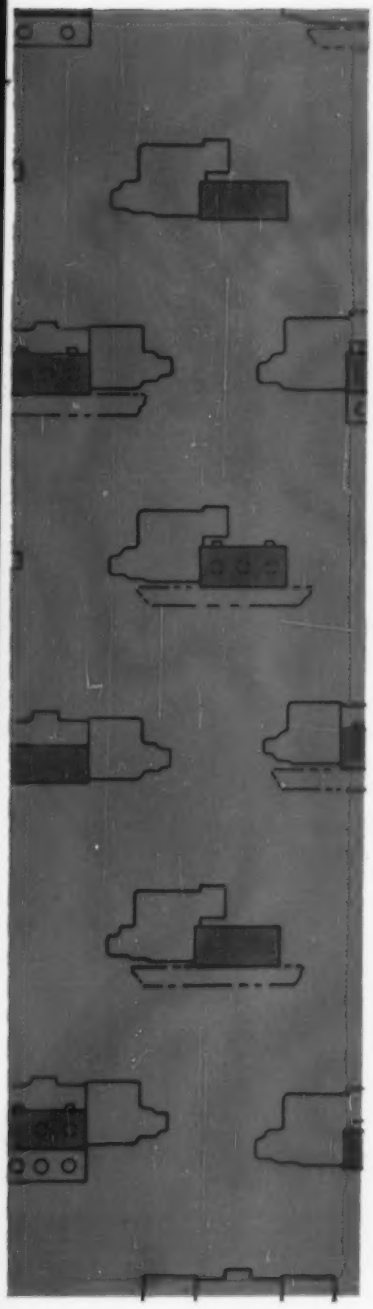
CYLINDRICAL PLUG AND RING GAGES • THREAD PLUG AND RING GAGES • THREAD MEASURING WIRES
MASTER SETTING DISCS • INTERNAL MICROMETERS • GROUND THREAD TAPS



ROSS
Control
VALVES

The Bridle for Air Horsepower

Ross



Introducing the

COMET II

An Advanced Conception of Valving by Ross!

Direct Solenoid Operated, Balanced Spool 4-Way for Air or Oil Service

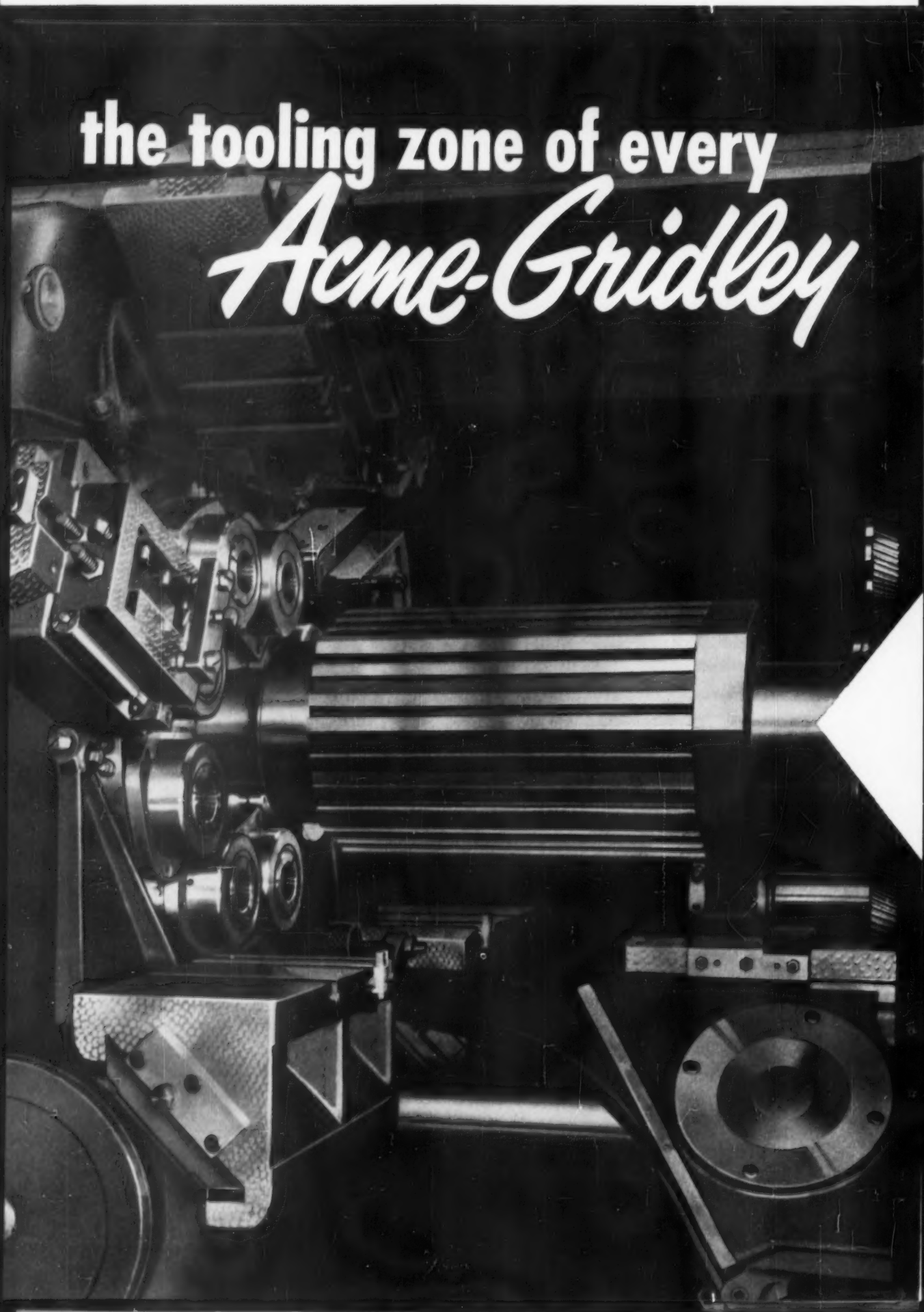
- Engineered and built to tolerances of .0001".
- Conforms to JIC standards.
- Complete valve cycle within 0.033 sec.
- Made of aluminum—single solenoid, base mounted weighs only 3½ lbs.
- Working surfaces almost as hard as a diamond.
- Small and compact—7¼" by 3½" by 3⅞". ¼" diameter flow capacity.
- Available with ¼" or ⅜" pipe tap for inline, manifold or base mounted; single solenoid spring return, double solenoid momentary; double solenoid three position.

Write, wire or phone for complete information

Tomorrow's EnginAIRing Delivered Today . . . Anywhere

OPERATING VALVE COMPANY

122 E. GOLDEN GATE AVENUE • DETROIT 3 • MICHIGAN

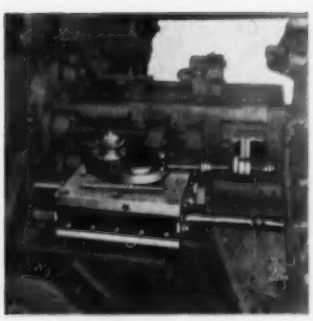

the tooling zone of every
Acme-Gridley

—open . . . *for business!*

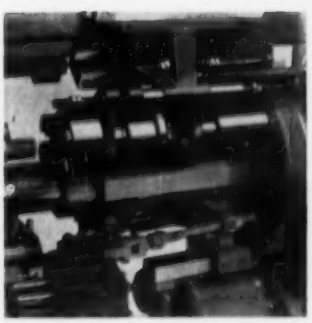
Since the primary advantage of a multiple-spindle automatic is to make it possible to complete more operations in a single setup, accessibility *to* and plenty of space *in* the tooling zone, *to apply the maximum number of tools*, is especially significant.

When you want to speed up production, perform unusual operations, or to get a finer finish, let a National Acme tooling engineer apply his COMPLETE LINE experience in helping you select the attachments to perform these operations on your machine.

Combination Cross Milling and Drilling Attachment



Worm or Thread Generating Device



Threading or Tapping Tool

LET US TELL YOU MORE ABOUT *Acme-Gridley* BASIC DESIGN

This is but one of many BASIC DESIGN features which are responsible for Acme-Gridley's outstanding performance records. May we send you additional information? Or, better yet, let us send a representative to discuss possible production short cuts with you.

National Acme

THE NATIONAL ACME COMPANY, 171 EAST 131ST STREET, CLEVELAND 8, OHIO

SALES OFFICES: • Newark, N. J. • Chicago, Ill. • Detroit, Mich.

16 surfaces

...on this Garrison Gear Chuck

THE BODY
(soft semi-steel)

THE CONTROL RING
(soft tool steel)

AND THE 6 JAWS
(hard tool steel)

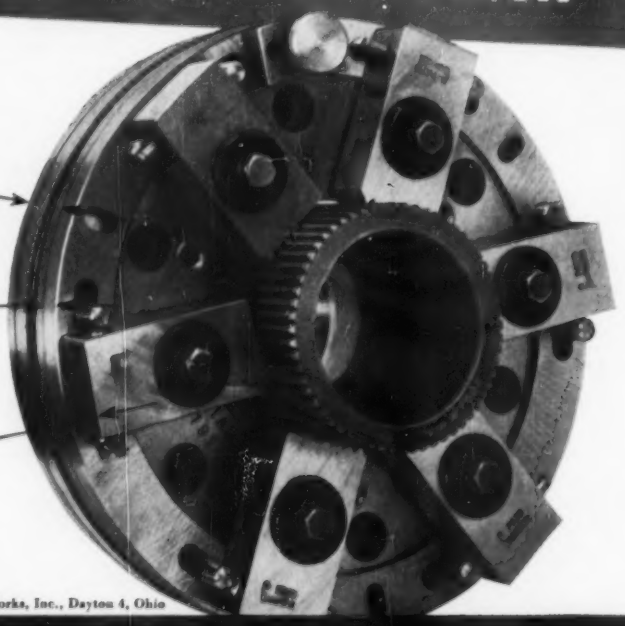


Photo courtesy of Garrison Machine Works, Inc., Dayton 4, Ohio

are Blanchard ground for precision

As every machinist knows, machine tools impart their precision through their chucks. That's why chuck dimensions and tolerances are of critical importance . . . and why Blanchard Surface Grinders are commonly used to produce the flat surfaces required.

Blanchard Surface Grinders are ideal for all kinds of precision grinding jobs. They produce extremely close tolerances for flatness, size and parallelism . . . *at low costs and high production rates.* Many Blanchard users grind surfaces flat to within 2 to 4 light bands, parallel to less than .0001", with dimension tolerance of .0002", and surface finish to better than 3 micro inches.

Whether your work involves precision machining or rapid removal of stock, take the advice of master machinists . . .

PUT IT ON THE BLANCHARD

No. 11 Blanchard Surface Grinder

Send for your free copies of "Work Done on the Blanchard", fourth edition, and "The Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

"AMERICANS" WORKING FOR NORDBERG

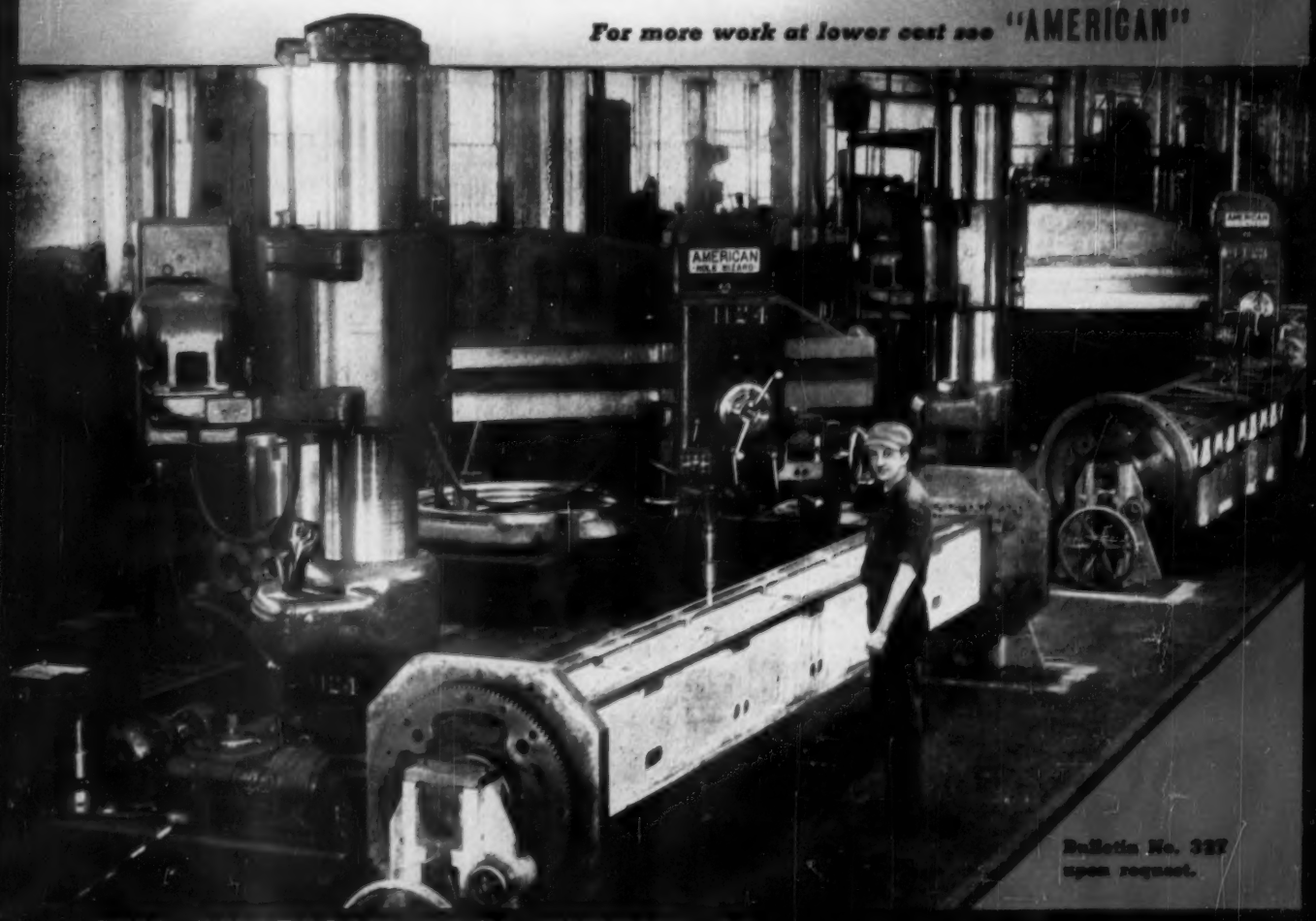
helping to profitably produce the quality products for which Nordberg Manufacturing Company of Milwaukee, Wisconsin is known the world over.

These "AMERICAN" Track Type Hole Wizard Radials mounted on mobile bases speed up drilling, tapping and boring operations in long, heavy work pieces by bringing the tool to the work rather than moving the work to the tool.

The work pieces are mounted in elaborate trunnion jig fixtures so different work planes may quickly be presented to the tool and a high degree of accuracy maintained.

The quality of Nordberg products is universally recognized. We are proud indeed that so many "AMERICAN" Lathes and Radial Drills contribute to it.

For more work at lower cost see **"AMERICAN"**



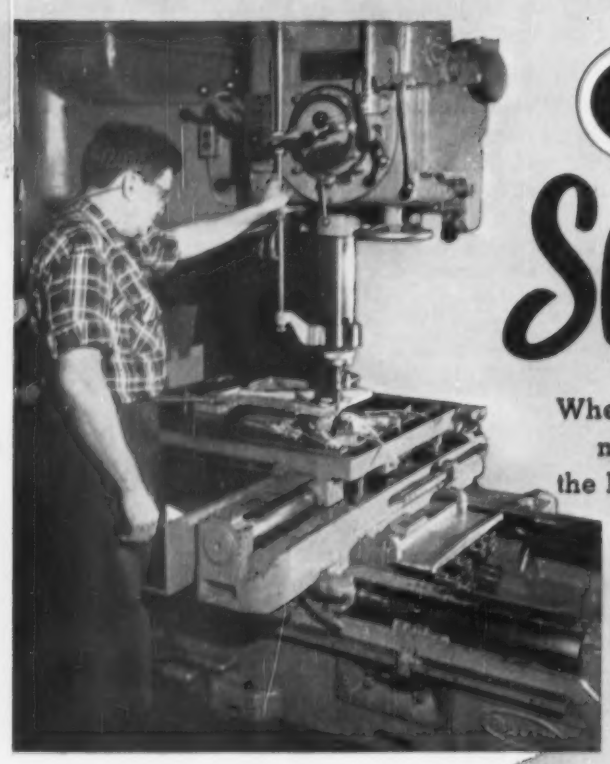
Bulletin No. 327 upon request.

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

ACCURATE LOCATING PERFORMANCE

Acclaimed By Customer with . . .



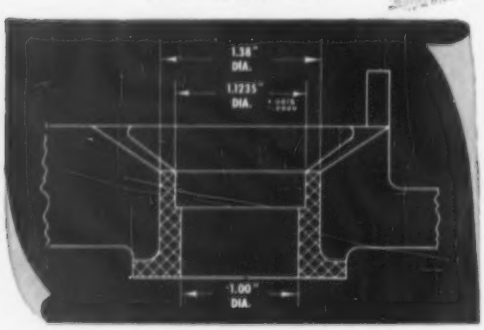
BULLARD Spacer Table

Where close tolerances must be maintained on repetitive pieces the Bullard Spacer Table is a "natural"

"The machine is simple to operate. We have found the Bullard Spacer Table very useful in our work", says a foreman at San Diego Division of Convair, "It eliminates the necessity of zeroing to a set position. And there is no chance for error, which is important when you make accurate parts for airplanes."

This same accuracy to close tolerances can be applied to your drilling, reaming or tapping operations without the high cost of jigs or fixtures.

Identical machining operations on each of three holes for battery carriage are performed on the Bullard Spacer Table.



OPERATION DATA

OPERATION	SET-UP TIME	UNIT TIME
Drill 1" dia.	.70	.2066
Counterbore 1.1235" dia. at 1.000 dia. .350" deep	.25	.0566
Face 1.38" dia.	.25	.0356

CALL YOUR NEAREST BULLARD REPRESENTATIVE OR WRITE FOR SPACER TABLE CATALOG TO

THE **BULLARD** COMPANY
BRIDGEPORT 2, CONNECTICUT

Five ways to combat the steel shortage

As a steel distributor we, too, are greatly affected by the current shortage of plates and structurals. We have noticed, however, that those steel consumers who do the following five things seldom fail to get their share of available steel.

1. USE WAREHOUSE STOCKS

Put the legitimate warehouses (steel distributors) in your area to work on your problem. They are close to mill sources—it is their business to have up-to-date information on steel supply.

2. CONSIDER SUBSTITUTES

Give these distributors an opportunity to offer you substitute sizes and grades. Most warehouses still have many tons of steel in stock in a wide variety of grades and sizes. The answer to your problem may be easier than you think.

3. USE THE BEST SOURCES

Divide your purchases of steel from warehouses among several legitimate concerns. Be sure at least one of these concerns is a large, national warehouse that can supply you with stock from other branches.

4. AVOID THE GREY MARKET

Stay out of the grey market if you possibly can. Every time you purchase steel at higher than market prices, you increase the incentive for sharp operators to divert steel from the normal channels of distribution.

5. MAKE A LIST

Keep your warehouse sources completely and currently informed of what you need. Don't just tell them you need "anything" in beams and plates—give them an exact list of the grades and sizes that you use and keep it up to date. This means extra work for you, but it can very well pay off to your advantage, for if your steel distributor knows exactly what you need, he will pick it up wherever and whenever he finds it available.

Here at U. S. Steel Supply, we stand ready to put a coast-to-coast and border-to-border steel service at your disposal. Call us to help you combat the steel shortage.

U.S. STEEL SUPPLY

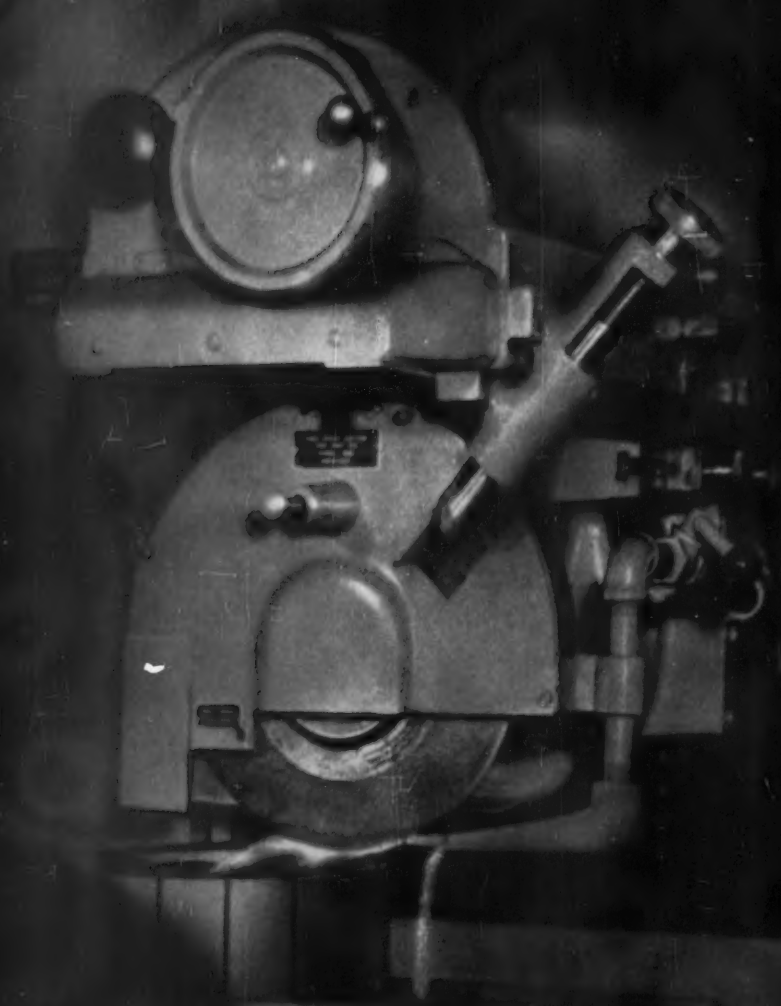
DIVISION

General Offices: 208 So. La Salle St., Chicago 4, Ill. Warehouses and Sales Offices Coast to Coast

UNITED STATES STEEL

WORLD'S MOST COMPLETE LINE

# of hydraulic surface grinders



invites your attention...

name the surface grinding job... Thompson has the machine

Thompson Type B

Surface dies or parts faster to part print, at lower cost, within wide size range

work size

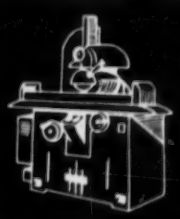
6" x 18" to 12" x 120"

Thompson Type F

For greatest precision, sensitivity and versatility in toolroom... or parts production at low cost*

work size

12" x 40" to 24" x 168"



Thompson Type C

Meets production and cost demands in larger size surface work of all types

work size

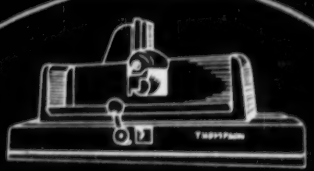
8" x 18" and 8" x 24"

Thompson Type CX

Offers both power and precision for heavy duty production... fast, accurate

work size

30" x 72" to 36" x 240"



Thompson SURFACE Grinders

* Including a complete line of Truform, Hydrail, Hydrovert, Twin Rotary and other special grinders for all sizes and types of work.

write for descriptive data

THE THOMPSON GRINDER COMPANY

SPRINGFIELD, OHIO

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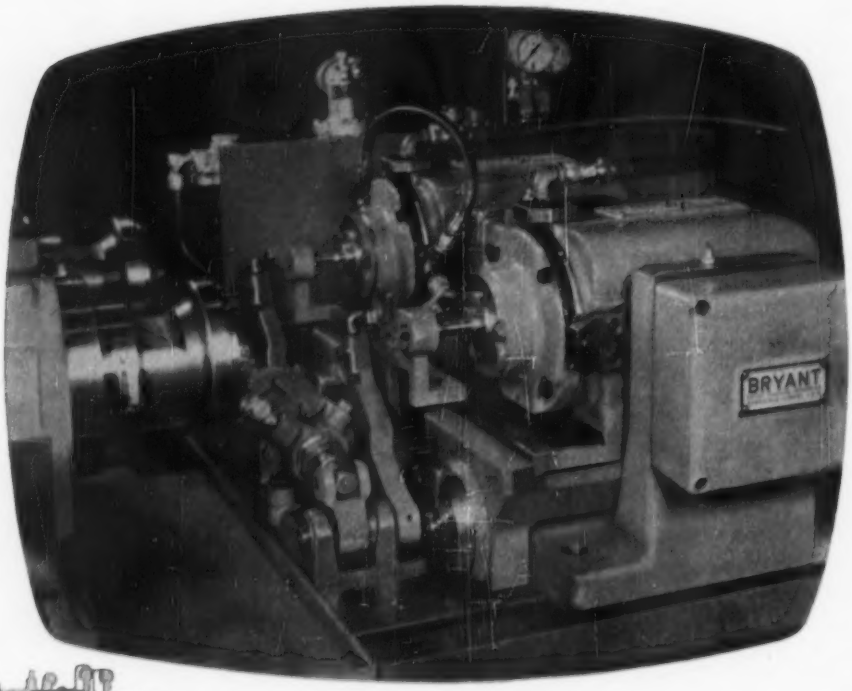
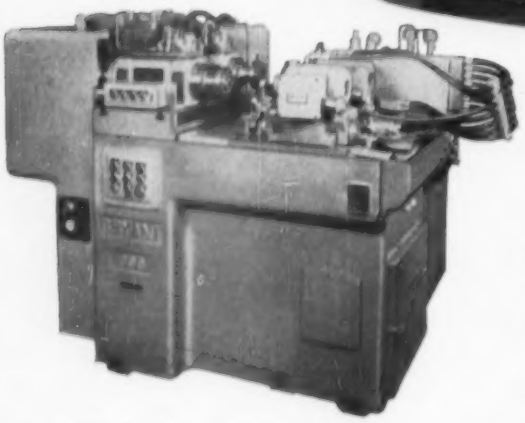
Burring bearing bores...

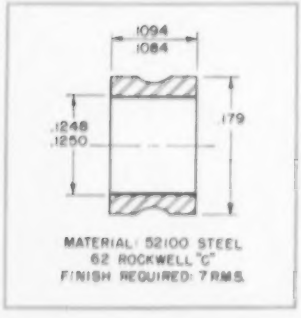




for greater accuracy and increased production

A manufacturer of extremely small ball bearings recently found that tooling the Bryant 998 precision boring machine with Bryant's *new* series 800 hi-frequency wheelheads resulted in higher production and fewer rejects.

The bores of hardened inner races are finished using burs to a tolerance of .0002, removing .005 stock – production, 280 pieces per hour at 100%.



The Bryant 998 is mechanically operated by positive cam action that provides constant tool control. Its table moves on pre-loaded, anti-friction ball slide ways. The ways are large-diameter hardened and ground steel bars that hold the table to a true path regardless of load or loading direction.

New series 800 Bryant hi-frequency wheelheads supply smooth, trouble-free operation for the toughest burring and grinding jobs at speeds from 10,000 to 100,000 R.P.M.

Write today for complete information on the Bryant 998. Ask also for information on Bryant Series 800 hi-frequency wheelheads.

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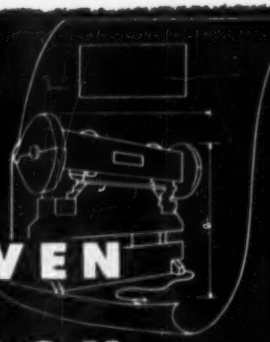
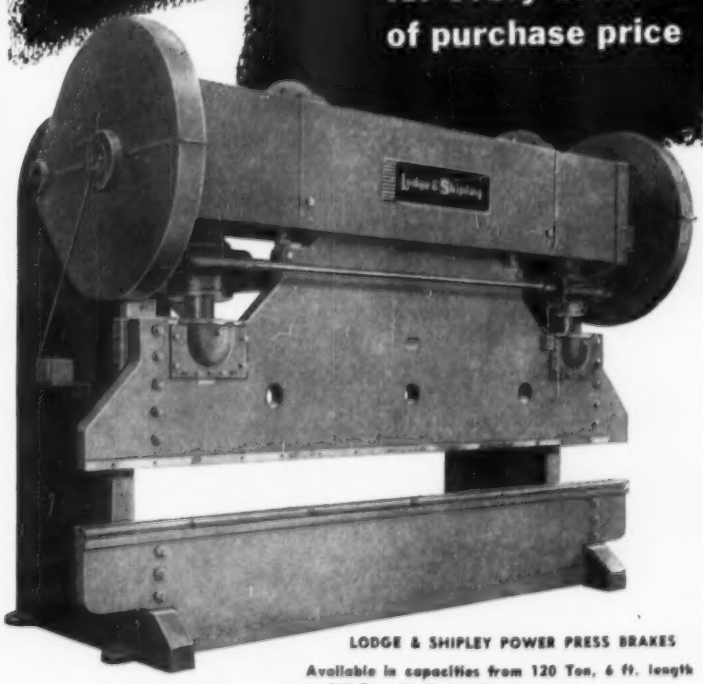


PROVEN DESIGN PLUS LODGE & SHIPLEY "KNOW HOW"

gives you a better brake for every dollar of purchase price



LODGE & SHIPLEY POWER PRESS BRAKES

Available in capacities from 120 Ton, 6 ft. length to 250 Ton, 16 ft. length.

From a background of more than 100 years of experience in building heavy metalworking equipment, Lodge & Shipley is producing power press brakes equal or superior to any other.

Built to Lodge & Shipley standards of strength and accuracy, for long service and minimum maintenance, these power press brakes offer many features which contribute to cost savings.

For example, the air clutch and spring brake is specifically designed for press brake service. The smoothly operating positive clutch is installed in a heavy, balanced flywheel. When the clutch is disengaged, the disc-type friction brake is automatically applied, positively holds the ram is any position.

Give yourself a *better brake*, check the many features of Lodge & Shipley power press brakes against any other power press brake . . . then make your decision.

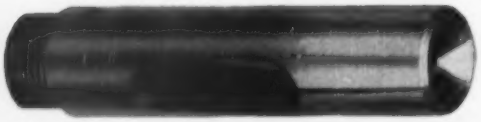
Write for FREE Bulletin PB-4 and the name of your nearest distributor.

THE **Lodge & Shipley** COMPANY

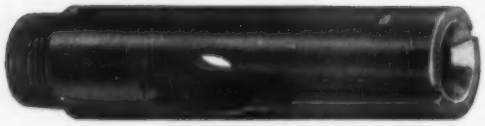
3056 Colerain Avenue
Cincinnati 25, Ohio

Power Spring Collets
(regular type)

Power Spring Collets
(taper nose type)



Feed Fingers (regular type)



Master Feed Fingers and Pads

Master Feed Fingers
with Adjustable Tension

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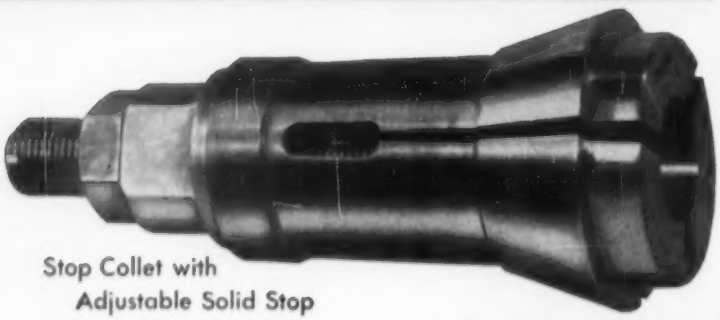
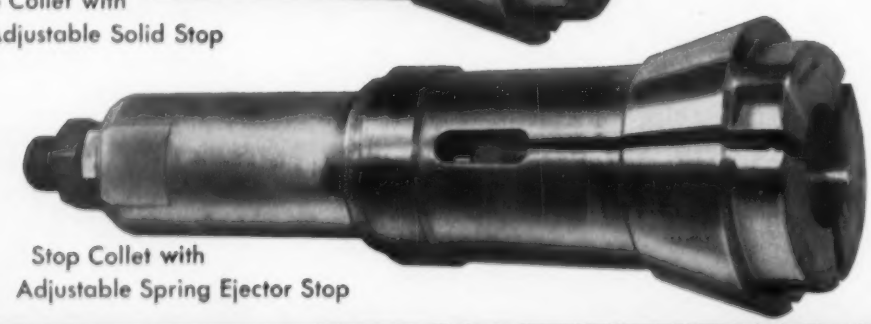
Deliveries from stock



Stop Collet with
Adjustable Solid Stop

SM 17



Stop Collet with
Adjustable Spring Ejector Stop

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PUTNAM TOOL COMPANY

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You can set a new High Torque Unbrako self-locking socket set screw and forget it—it stays tight

There are several reasons: the deeper socket which gives you better purchase with the wrench; the rounded socket corners which eliminate the sharp corners where cracks start; the special methods of heat treatment in atmosphere-controlled furnaces; the development of fully formed threads.

Up to 40% higher tightening torque— a new Unbrako feature

RECOMMENDED SOCKET SET SCREW TIGHTENING TORQUES (Inch-Pounds)

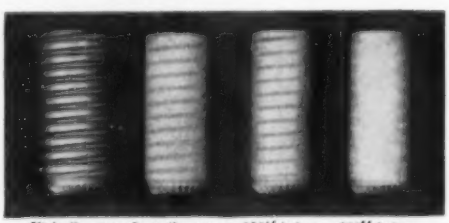
SCREW SIZE	UNBRAKO	SET SCREW B	SET SCREW C	MINIMUM DIFFERENTIAL %
#4	5	3.9	3.5	28
#5	9	7.8	7.4	15
#6	9	7.8	7.4	15
#8	20	14.7	14.5	36
#10	33	26.5	25	25
1/4	87	62	60	40
5/16	165	122	125	32
3/8	290	198	225	29
7/16	430	309	350	23
1/2	620	460	500	24
5/8	1225	1106	1060	11
3/4	2125	1540	1800	18
7/8	5000	3660	4600	9
1	7000	5025	6500	8

ALL UNBRAKOs can withstand higher tightening torques than ordinary set screws. For example, the recommended torque for a ¼" UNBRAKO is 87 inch-pounds—40% greater than that recommended for an ordinary set screw.

These microphotographs illustrate just what fully formed threads do for the new High-Torque UNBRAKO. They make the whole screw stronger. The metal is compressed into the closely knit grain structure that you see. The grain flow follows the contour of the threads. There are no straight lines along which shear can occur. The UNBRAKO retains its flow lines even when ground down to .010" below root diameter. Screws with cut or ground threads lose thread form at root diameter.

You can't buy a better set screw than an UNBRAKO. See your authorized industrial distributor today. Or write STANDARD PRESSED STEEL Co., Jenkintown 1, Pa.

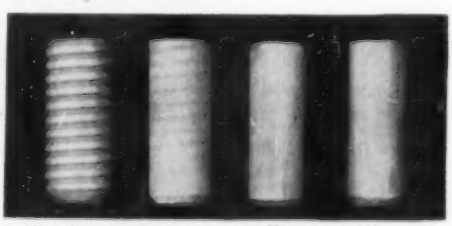
Unbrako Set Screw



Pitch diameter | Root diameter | .005" below root diameter | .010" below root diameter

Fully formed threads make the whole screw stronger. The metal is compressed into a closely knit grain structure. The grain flow follows the contour of the threads. The UNBRAKO retains its flow lines even when ground down to .010" below root diameter. Screws with cut or ground threads lose thread form at root diameter.

Ordinary Set Screw



Pitch diameter | Root diameter | .005" below root diameter | .010" below root diameter

STANDARD PRESSED STEEL CO.

UNBRAKO SOCKET SCREW DIVISION SPS JENKINTOWN PENNSYLVANIA

There's **MORE** Cooling Surface in these deep-ribbed **MOTORS**

No Day is FRYDAY

with these Allis-Chalmers MOTORS

● Frying of insulation is impossible under normal conditions with the extra-large cooling surface of Allis-Chalmers rib-type TEFC motors. The result—you expect and get longer motor life.

The engineered partner of A-C motors is Allis-Chalmers control.

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ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-4881

New "triple duty" Danly Press

-Draws-Blanks-Forms

FINGERTIP GEAR CHANGE AND EXTRA LONG SHUT HEIGHT ADJUSTMENT PERMIT QUICK SHIFT FROM BLANKING TO DRAWING OPERATIONS...SOLVE SHORT-RUN STAMPING PROBLEM FOR LEADING HEATING UNIT MANUFACTURER

A leading manufacturer of home heating units needed a great variety of stampings . . . large blanks, drawn parts and deep formed pieces. Stamping these parts on a relatively short-run production basis would tie up entire lines of presses . . . unless one press could do the job. A specially designed Danly Press that blanks, draws and forms . . . and converts to these three types of operations quickly and easily . . . solved the problem.

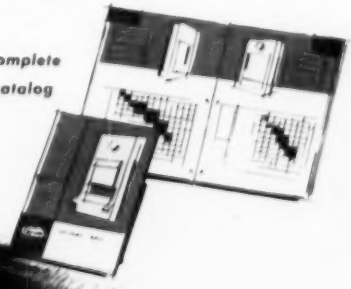
Two unusual features give this "triple duty" Danly Press its unusual adaptability. First, the 24" stroke with a 30" range of shut height adjustment accommodates shallow blanking operations or deep dies for drawing and forming. Second, special gearing controlled from the master panel is easily changed to permit stroking at two speeds – one ideal for drawing, the other faster for blanking. Speed selection is controlled from the operator's station. The result: a "triple duty" Danly Press suitable for producing a tremendous variety of big stampings.

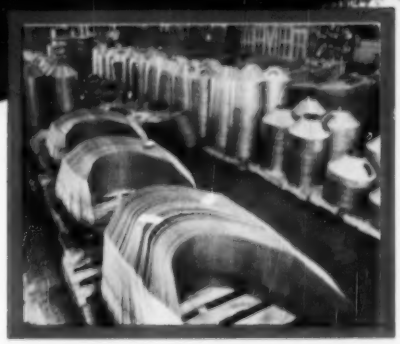
If your operation requires short production runs of a great many different kinds of stampings, Danly can help solve your production problem, conserve workhours and manpower. Danly presses will make your pressroom more efficient for your specific type of work. *Talk with a Danly engineer – soon!*

DANLY MACHINE SPECIALTIES, INC.

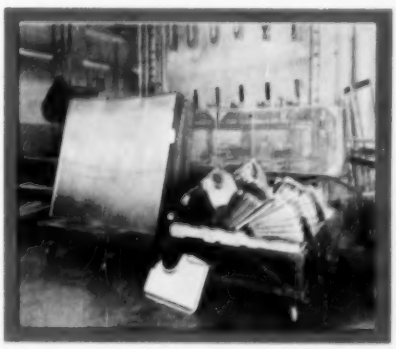
2100 South Laramie Avenue
Chicago 50, Illinois

Write for complete single action straight side press catalog





Stocks of parts produced on the specially built "triple duty" Danly Press. Note variety and size, particularly depth of form on V-shape stampings.



The contrast in these parts typifies the production problem solved by the Danly "triple duty" press.

An array of stampings like this would normally require several types of presses.

DANLY®

a complete **AIRCOMATIC**® "package" . . . from recommendation to results

Aircomatic welding is an inert-gas, shielded arc process using a a consumable wire electrode. The basic unit, manual or automatic, designed and manufactured by Airco, includes the welding head, carriage assembly for wire drive and control equipment, cables, hoses, and flexible wire casing.

The consumable wire electrode is produced to rigid Airco specifications as to purity, cast, and metallurgical content. Normally supplied on expendable spools, Aircomatic wire is available in aluminum, steel, stainless steel, nickel, titanium, copper, and copper base alloys.

Airco shielding gases include both helium and argon, produced by Airco, or mixtures thereof for particular requirements. Pure carbon dioxide gas is also available from Airco for use as a shielding medium where applicable.

Aircomatic is a direct-current welding process. A complete line of Airco motor-generator and rectifier type welders are designed for Aircomatic characteristics — the latest of which is a new constant potential 800 amp ACV welder.

The Aircomatic process was invented, designed, developed, and licensed by Airco. Airco's eight years of experience have given the metal working industry an inert-gas process that welds all kinds of metals — adding speed, economy and versatility to every suitable application.

An Airco Representative can give you a completely unbiased opinion as to how Aircomatic can best be employed—because—Airco is a leading manufacturer-supplier of all types of oxyacetylene, metallic arc and inert-gas shielded welding and flame cutting processes, their controls, supplies, and accessories.

Other Airco inert-gas welding processes include Aircospot and Heliwelding. Write today for details.

welding
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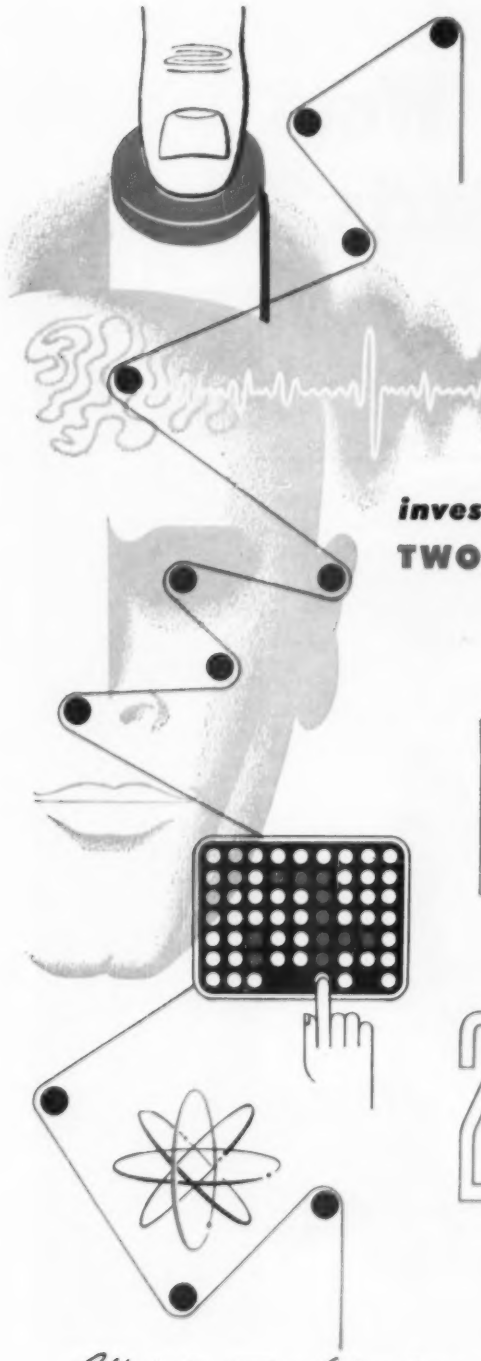
Products of the divisions of Air Reduction Company, Incorporated, include: **AIRCO** — industrial gases, welding and cutting equipment, and acetylenic chemicals • **PUBECO** — carbon dioxide, liquid-solid ("DRY ICE") • **OHIO** — medical gases and hospital equipment • **NATIONAL CARBIDE** — pipeline acetylene and calcium carbide • **COLTON** — polyvinyl acetates, alcohols, and other synthetic resins.



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Complete service includes planning step-by-step sequence of operations and the individual engineering of processes, methods and equipment to meet your production needs. Barnes' creative engineering, developed over a period of 80 years in designing and building high production machine tools, can be depended upon to provide you with the latest in cost-cutting methods. Our highly versatile engineering staff will work with you as a team to solve problems quickly and efficiently.

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To meet specific work-handling or processing needs, Barnes' engineers have designed and built special conveyors, turn-over mechanisms, inspection, and assembling equipment to suit either automatic or semi-automatic requirements. Hundreds of units are today profitably serving a wide range of industries. Because electrical, hydraulic, mechanical, tool and fixture engineering is closely coordinated at Barnes under one roof, you save time and eliminate divided responsibility.

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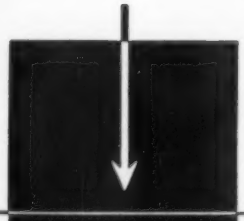
SPECIAL MULTIPLE SPINDLE MACHINE TOOLS • SPECIAL PROCESS EQUIPMENT SPECIAL ELECTRICAL CONTROLS

NUMBER ONE IN A SERIES

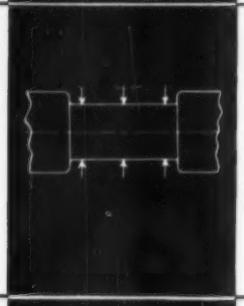
What's The Best Way To Gage These Parts ?

Tips from Taft-Peirce on when and where to use a T-P CompAIRator Air Gage



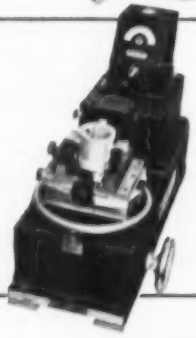
Three OD's
Tolerance: .0009″

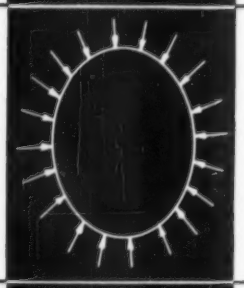
One three dial T-P CompAIRator and Air Snap Gage checks three points simultaneously on the journals of an automotive crankshaft. Functions of the diameter (taper, barrel shape, etc.) may be seen at a glance. Simple, accurate, fast — savings in inspection time alone paid for this unit in short order.



Ovality
Tolerance: .007″ on radius

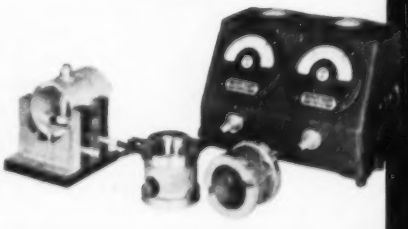
One single dial CompAIRator Air Gage checks the contour of the skirt section on this piston. Indexing table is graduated in 5° increments, permits checking entire contour at one setup. Extremely sensitive yet sturdy, vibration, jarring, tilting won't disturb the accuracy of a T-P CompAIRator.

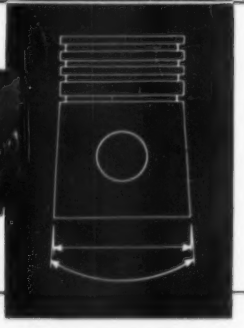




Taper and Diameter
Tolerance: .002″

A two dial T-P CompAIRator slashes former inspection costs. One indicator checks diameter. The other, a new T-P Computing CompAIRator, measures and *figures* the taper. Indicates it directly on the dial face. Eliminates usual 2 measurements and a computation. Computing CompAIRators may also be used to check center distance, concentricity of diameters, and squareness of bore to face.





For more examples and the complete story on Taft-Peirce CompAIRator Air Gages send for Bulletin.

WHAT IS A COMPAIRATOR AIR GAGE?

A CompAIRator is a sensitive gaging instrument that measures variations in the velocity of tiny jets of air. When work is placed over these jets, air flow is restricted and its velocity reduced. Any change in air velocity reflects a change in part size, which is immediately shown on a calibrated indicator. Since only air contacts the part in most cases, there is minimum wear on gaging members. Fast, accurate, dependable, a T-P CompAIRator is simple to operate, requires little or no maintenance.

STANDARD AND SPECIAL COMPAIRATORS | COMPUTING COMPAIRATORS | AUTOMATIC SORTING MACHINE | AIR ELECTRIC COMPAIRATORS

T-P means Top Precision

T P

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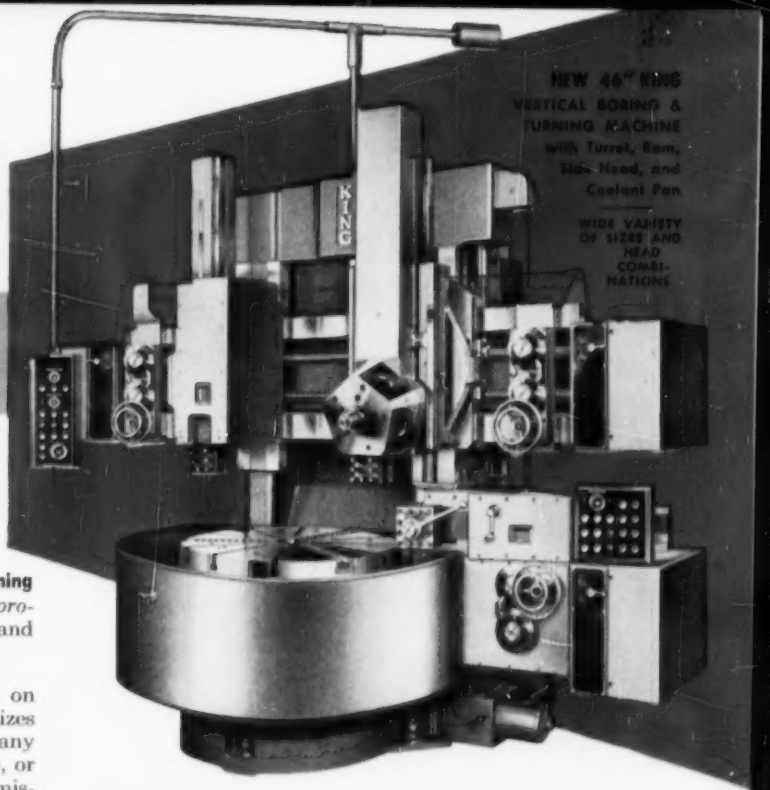
POWERED FOR PRODUCTIVITY

...the all new

KING

greater horsepower — expanded speed and feed ranges — permit use of modern cutting tools to their fullest capabilities


NEW 46" KING
VERTICAL BORING & TURNING MACHINE
with Turret, Ram, Side Head, and Coolant Pan
WIDE VARIETY OF SIZES AND HEAD COMBINATIONS
KING

Completely re-designed King® Vertical Boring & Turning Machines bring to boring mill users the *greatest productive capacity ever achieved* for vertical boring and turning work.

Horsepower has been increased to 40 to 50 H. P. on 30″ to 46″ machine sizes; 75 to 100 H. P. on sizes 56″ and up. Spindle drive provides 24 speeds in any one of three standard ranges: high, intermediate, or low. As illustrated below, complete drive transmission is mounted in an extra-rugged housing, providing greatly increased stability. The entire drive can be removed from the machine as a unit.

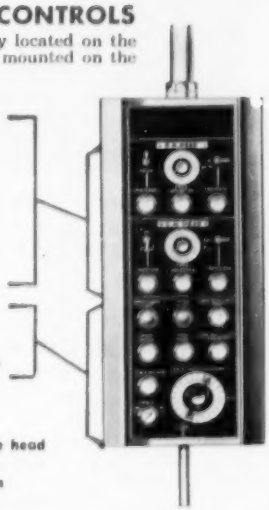
24 feeds from .0016″ to .250″ per revolution are provided. The exact feed can be selected to produce the desired surface finish on any material at the required production rate.

Complete electrical controls are provided, located on pendant station and on fixed panel mounted on side head, for maximum ease and speed of manipulation.

With many other features, the *all new* King provides industry with a high-efficiency machine tool capable of taking full advantage of new cutting tools, new materials, new methods. For full details, send for new Catalog K-5. Write direct or to the King distributor in your area.

COMPLETE ELECTRICAL CONTROLS

All electrical controls are conveniently located on the pendant station and on a fixed panel mounted on the side head, as follows:



LOCATED ON PENDANT—

Feed and rapid traverse movements
— and —
Pre-selective feed selection from direct-reading dials:
for rail heads on machines with two heads on rail . . . for rail head and side head on machines with one head on rail.

Power swiveling of rail heads

Pre-selective speed selection from direct-reading dial

Speed change · Turret index · Table step

LOCATED ON SIDE HEAD PANEL—

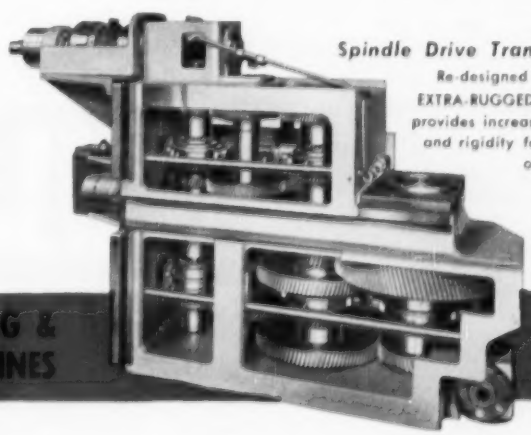
Feed and rapid traverse movements of side head
— and —
Pre-selective side head feed selection from direct-reading dial:
on machines with two heads on rail.

Main drive · Rail positioning · Coolant pump

Thread cutting and taper turning selection for all heads

Additional Features of the ALL NEW KING

- **NEW SPINDLE AND SPINDLE MOUNTING, PROVIDING MAXIMUM TABLE STABILITY.**
- **AUTOMATIC LUBRICATION OF ALL MOVING PARTS.**
- **ANTI-BACKLASH NUTS FOR ALL CROSS-FEED MOVEMENTS.**
- **MACHINE ADAPTED FOR SIMPLE OPTIONAL ADDITION OF:**
  - *Automatic positioning of heads.*
  - *Automatic tracing control of heads.*
  - *Automatic cycling.*
  - *Power rail clamping.*
  - *Power indexing of turrets.*



Spindle Drive Transmission

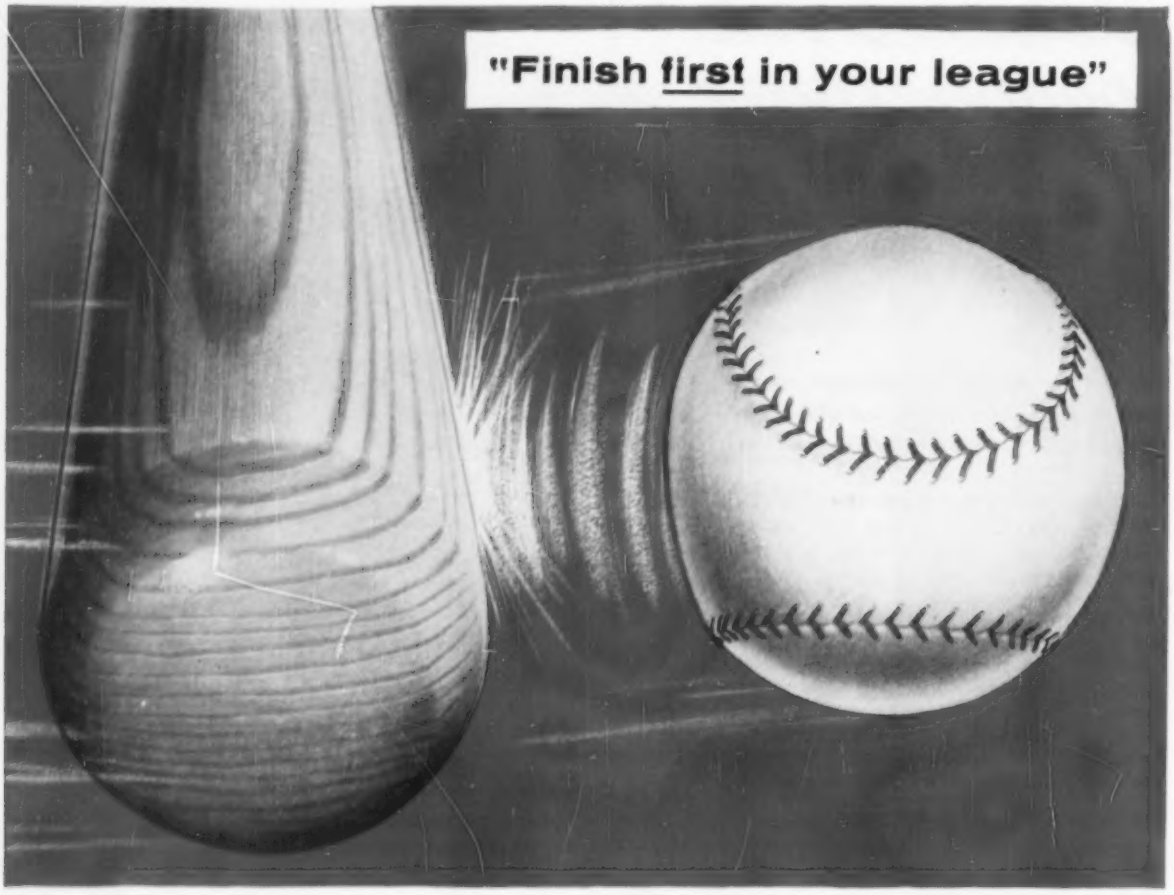
Re-designed throughout. EXTRA-RUGGED HOUSING provides increased stability and rigidity for mounting of the shafts.

•

Short shafts used throughout with points of [illegible] located adjacent to bearings

American Steel Foundries
KING MACHINE TOOL DIVISION
1150 Tennessee Avenue • Cincinnati 29, Ohio

KING VERTICAL BORING & TURNING MACHINES



. . . with J&L COLD FINISHED LEADED STEELS

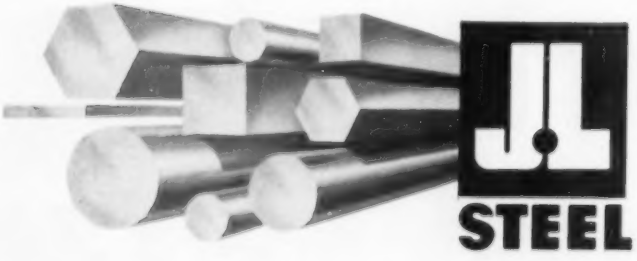
These modern, superior J&L Leaded free-machining cold finished steels are meeting with outstanding acceptance in machine shops everywhere. They are a star member of the complete line of premium quality, free-cutting cold finished bar steels produced over the years by J&L specialists. Thus, we can recommend the right type to help solve your machining problems.

Available in *both Bessemer and Open-Hearth grades*, J&L Leaded steels offer:

- **SUPERB MACHINABILITY**—because they enable you to use optimum cutting speeds, to secure longer tool life and to produce superior surface finishes.
- **GREATER UNIFORMITY**—because they are completely J&L-produced from the basic raw materials to guarantee optimum uniformity so necessary for today's high-speed machining operations.
- **HIGHEST QUALITY**—because they must meet the rigid quality standards developed by J&L through years of leadership in the development and production of free-cutting steels.

Adequate stocks of all J&L cold finished free-machining steels are available in important industrial centers. Phone the nearest J&L District Office or your Distributor for prompt and efficient service.

Pick the Free-Machining Steel that serves you best—from J&L's complete Cold Finished Line



Jones & Laughlin
STEEL CORPORATION · PITTSBURGH

COLD FINISHING PLANTS AT
PITTSBURGH, PA., AND HAMMOND, IND.

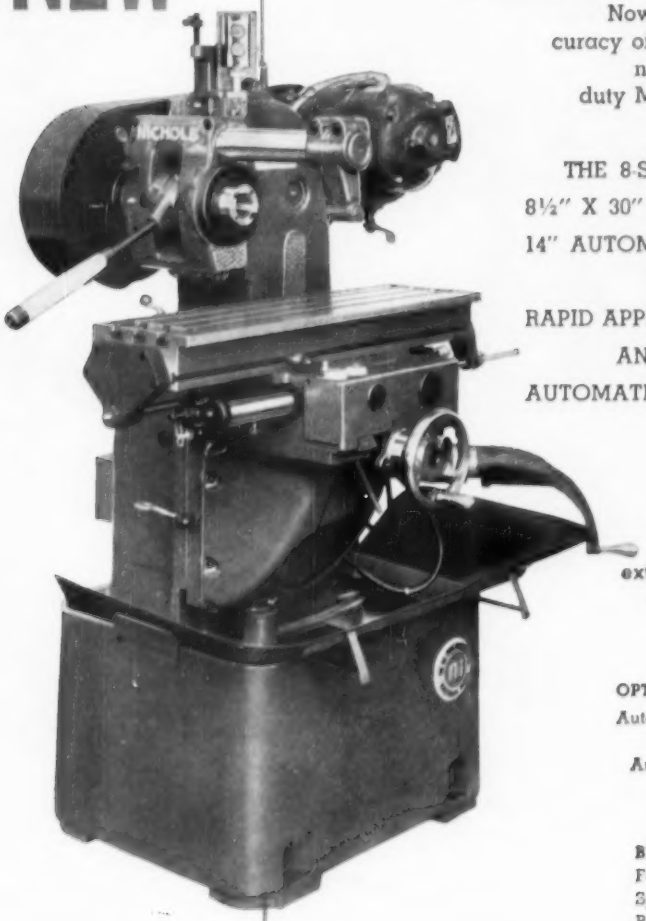
"Anything almost right is wrong"

W. H. NICHOLS
1873 1951

NEW NICHOLS

Semi-Automatic Miller

Now Nichols matches the unequalled accuracy of its famous hand-miller in the new semi-automatic heavy duty Miller #8-SA.



THE 8-SA MILLER BY NICHOLS PROVIDES
8½" X 30" TABLE WITH 3 T-SLOTS
14" AUTOMATIC PNEUMATIC LONGITUDINAL TABLE FEED WITH
RAPID APPROACH, SLOW CUTTING FEED, AND RAPID RETURN . . .
AUTOMATIC TABLE WAY LUBRICATION.

The Nichols 8-SA is a production miller with vertical and transverse table screw feed featuring a **heavier knee** and **extra wide saddle** for greater bearing surface . . . air equipment **inside** the saddle saves space.

OPTIONAL:

Automatic Pneumatic Down Feed To Spindle Head
Automatic Pneumatic Transverse Table Feed
Automatic Milling Cycle through synchronization of any two pneumatic feeds.

BRIEF SPECIFICATIONS: • Table 8½" x 30" Feed 0-60" min. • Rapid traverse 300" min. Spindle speeds available up to 5000 rpm.

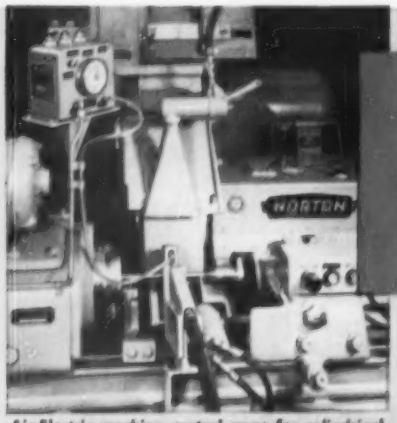
Range: Longitudinal table feed 14"
Transverse table travel 6"
Vertical travel of knee 11"
Rise and fall of spindle head 4½"

Write for catalog on the Nichols way to increase production and lower costs. Reservation may be made for sound, color film, "The Miller That Uses Its Head".

W. H. NICHOLS COMPANY
WALTHAM 54, MASS.

National Distributors
NICHOLS-MORRIS CORPORATION • 76F Mamaroneck Ave., White Plains, N.Y.

How would you

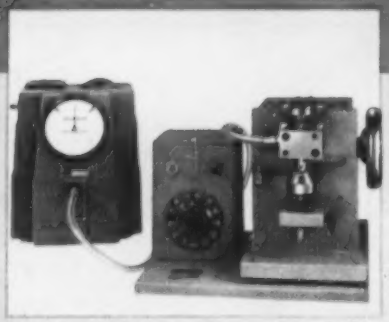


Air-Electric machine control gage for cylindrical grinder.

Gage for checking taper on piston skirts.

Recording individual measurements taken with an air-ring.

No. 247 radial play gage for ball bearings.

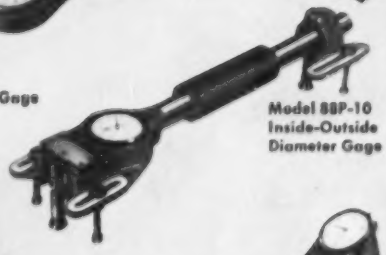


Gage for checking gyroscope rotor end play.

Series 205 Hole Location Gage checks holes in workpiece for parallelism.

Series 1250 Hole Gage

Model 1000P-61
Adjustable Snap Gage



Model 88P-10
Inside-Outside
Diameter Gage

Model 75P-10
Adjustable
Depth Gage

Series 45
Thread Pitch
Diameter Gage

Federal's Solution to the Cost of Gaging:
Impartial Gage Selection
Engineering Follow-Through
Everything in Gages

Model 130
Electronic
Comparator

Model 136 Horizontal
Master Comparator

GAGE THIS DIMENSION 10 times or 10,000 times?

It is claimed that 75% of all metalworking production is made up of small lots of 25 workpieces or less. This emphasizes that in most cases it is important to carefully select gages at the lowest cost commensurate with necessary accuracy.

Federal makes a complete line of all types of gages employing practically every system of visual gaging. Listed in our catalog and readily available from stock are countless Dial Indicator Gages ideally suited for everyday inspection of small runs. When a higher degree of accuracy, foolproof operation, and faster gaging are required, the purchase of a Federal Dimensionair Air Gage may pay big dividends. And where large production warrants the investment, we design and build automatic gages for high speed sorting and machine control.

When a manufacturer makes only certain types of gages, he naturally recommends these for all applications. For instance, a manufacturer who specializes only in Dial Indicating Gages obviously cannot meet every modern gaging requirement. Neither can an Air Gage manufacturer honestly recommend his type of gage for every measuring job. Those who buy the wrong gage can't be blamed if they don't know the facts.

Before you decide what gages you need, bring your problems to Federal. Our engineers, without bias, will suggest the *best* solution . . . and may save you considerable money. Write or call us today.

FEDERAL PRODUCTS CORPORATION
6124 Eddy Street • Providence 1, R. I.

- Air-Electric Gages
- Air Gages
  - a full line of accessories
- Automation Gages
  - Employing all gaging systems
- Grinding Gages
  - Continuous
- Dial Indicator Gages
  - Catalog and Special Types
  - Thousands of Designs
- Dial Indicators
  - The only complete line
  - Regular type — hundreds of Variations
  - Super-sensitive
  - Perpendicular indicators
  - Test indicators
  - Lifetime
  - Dial Indicator Test Sets
  - Wetproof Indicators
  - Long range indicators
- Electric-Dial Indicator Gages
- Electronic Gages
- Micrometers
  - Indicating
- Master Setting Disc & Rings
- Multiple Dimension Gages
- In-process Gages
- Thousands of special designs for thousands of special needs

Ask **FEDERAL** *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

SEE ALSO NEXT PAGES

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging

This is why you

The One-Master Air Gage. Features that make it *the* Air Gage for your plant

1 **One master, only, required.**

2 **Constant, positive accuracy.** Its balanced air system is positively controlled — its accuracy built in. It can't drift.

3 **Dependable stability.** Unaffected by surges, or changes in air pressure.

4 **Linear, direct reading scale.** Not a "go" and "no go" gage. Its positively controlled accuracy permits a calibrated linear scale having graduations of ***known value.***

5 **Longer range per magnification** .003" and .0015", on 2,500 to 1 and 5,000 to 1 respectively, take care of 90% of gaging requirements and provide the following advantages:

Greater Plug clearance makes easier and faster application of gage heads to work. More foolproof . . . less wear.

Longer approach range. Operator sees how he's doing before workpiece dimension reaches the required size, eliminating scrap.

Longer gage head wear. Greater range and clearance enable gage heads to wear longer. Gage heads easily refinished.

Greater jet protection. Lower jets protected from damage.

6 **Fast, easy setting.** Positive setting in ten seconds. No fiddling around balancing air pressure.

7 **Easiest to install.** Connect directly to air supply. Filter already attached. Pressure regulator which assures ample protection is built in — only 40 lbs. pressure required.

8 **Less maintenance.** Gage system better protected, larger jets stay clean. Maintenance is negligible if gage is installed properly.

9 **Easily adaptable to special requirements** and combined with electrical and electronic units for ***automatic gaging and machine control.***

SEE ALSO PRECEDING PAGES

Ask **FEDERAL** *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging

need only ONE master!

This air gage system *is basically different from that of other air gages.* It employs a *balanced air system.* One side of this system — the measuring side — is *rigidly fixed.* There is no adjustment and measurements *cannot vary.* Hence, the gage *is linear* over its long range and *can be calibrated* and *set with a single master.* Because of this, the Dimensionair is an air gage of dependable stability. *It cannot drift . . . throughout its long range.* In these ways the Dimensionair is different from gages requiring two masters.

The balancing side of the system has a *single* zero adjustment. This enables you to set the Dimensionair positively and instantly to zero, *with a single master,* as you do a Dial Indicator, Micro-Electric Meter, Electronic Comparator or other precision measuring instrument. Excess bits of dirt, oil or water *do not* affect the Dimensionair any more than they do other air gages. *But,* some gages are too *insensitive* to show up such failure.

If you are familiar with ordinary air gages requiring two masters, you'll appreciate the advantages of using *one* master. You *save half the cost of masters* and you set the gage as easily and simply as you set your watch. Moreover, you will experience, for the first time, a confident feeling of *dependable, non-drifting,* precise measuring.

The Dimensionair's basic system enables it to be *combined directly* with electrical and electronic units as used with *Machine Control* and *Automatic Sorting* Gages. This makes unnecessary the accessory equipment required by other air gages and permits higher speeds, greater precision—with assured stability. It is much easier to set the gage to the spread between electrical contacts; e.g. the spread between the machine's fine feed and the finish feed. Adjusting to zero *does not* affect this spread setting.

Why not find out for yourself the importance of these facts? Ask to have a Dimensionair put in your plant so you can try it with your own personnel. *Compare it with any other air gage* you may already own or any you may wish to have brought in for comparison.

FEDERAL PRODUCTS CORPORATION

6124 EDDY STREET • PROVIDENCE 1, RHODE ISLAND

Federal's solution to the cost of gaging:
Impartial Gage Selection
Engineering Follow-Through
Everything In Gages

mail coupon today

Federal Products Corporation
6124 Eddy Street, Providence 1, R. I.

We'd like to test a Dimensionair in our plant.

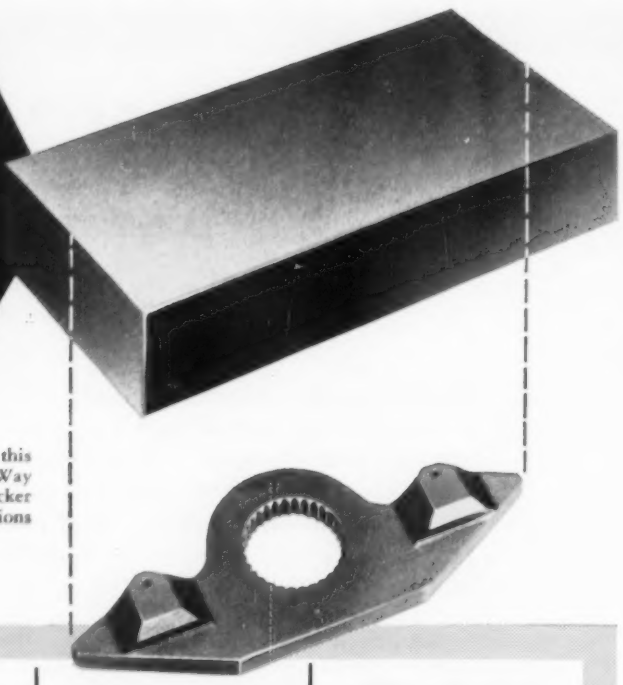
Company Name .....

Your Name .....

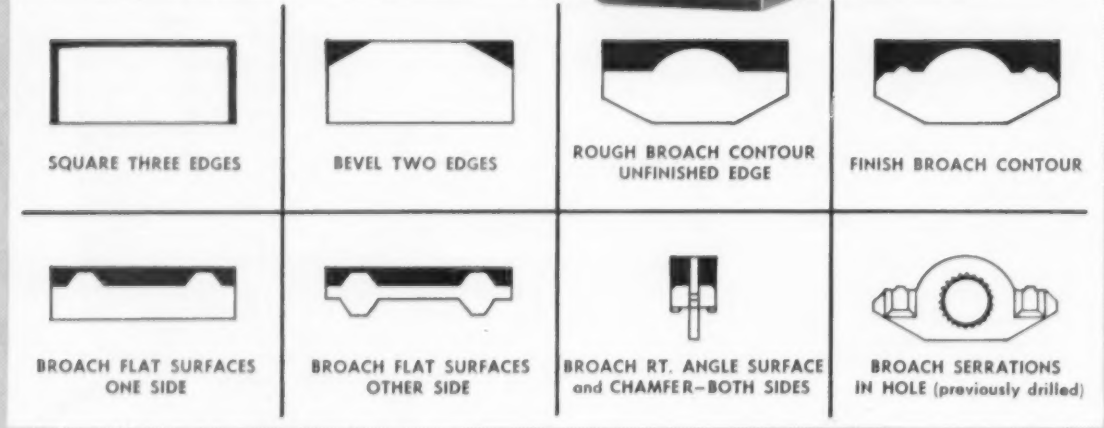
Title .....

Address .....

ROCKER ARM
machined from bar stock
in 8
BROACHING OPERATIONS



Broaching's all-round versatility is illustrated by this unusual adaptation of a standard American 3-Way broaching machine for the production of finished rocker arm part from bar stock. The eight broaching operations are shown in sequence below.


SQUARE THREE EDGES
BEVEL TWO EDGES
ROUGH BROACH CONTOUR UNFINISHED EDGE
FINISH BROACH CONTOUR
BROACH FLAT SURFACES ONE SIDE
BROACH FLAT SURFACES OTHER SIDE
BROACH RT. ANGLE SURFACE and CHAMFER–BOTH SIDES
BROACH SERRATIONS IN HOLE (previously drilled)

Small quantity production of this rocker arm part, plus a requirement that all surfaces be finished, made a forging impractical. Broaching gave the desired finish and confined the operations to one machine so that holding and locating fixtures were simplified.

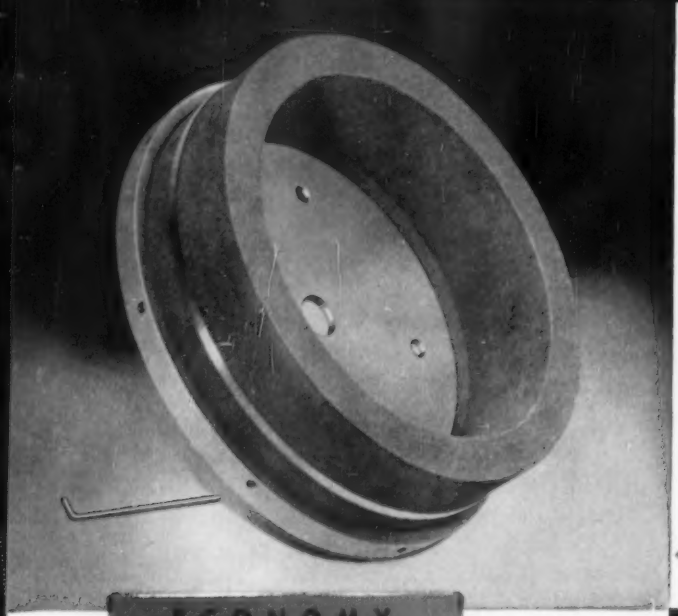
American designed and built the broaches and had previously supplied the 3-Way vertical hydraulic broaching machine. But to American's good customer, The American Tool Co., Kalamazoo, Mich., goes the credit for the ingenuity displayed in developing the operation and building the interchangeable fixtures.

Whether you require eight operations on few parts, or one operation on thousands, the versatility of American broaches, fixtures and broaching machines can mean gains in your output, cuts in your costs. Give American the details; you'll receive a prompt recommendation.

ASK FOR CATALOG 450

American BROACH & MACHINE CO.
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

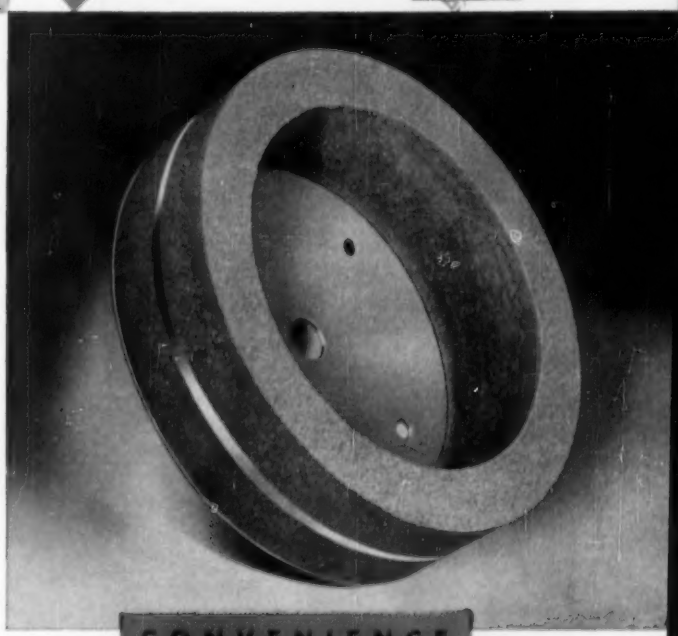
See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery



ECONOMY

two efficient ways

to solve the same problem !



CONVENIENCE

STERLING EASYMOUNT and PLATE MOUNTED WHEELS

provide equal winning performance for carbide tool grinding

For faster, expert carbide tool grinding, folks find record-breaking performance every time from the Sterling Twins—the Easymount or Plate-Mounted Wheel.

You cannot go wrong on either choice of abrasive tools. Many choose the Easymount for economy and others like the Plate-Mounted Wheel for its convenience. Both provide economical, more precise grinding of carbides every time.

Ask for a trial of either the Easymount or Plate-Mounted Wheel—or both! Sterling engineers will gladly show you how quickly either Sterling unit pays for itself.

THE WHEELS OF INDUSTRY
STERLING ABRASIVES

STERLING GRINDING WHEEL CO., TIFFIN, OHIO

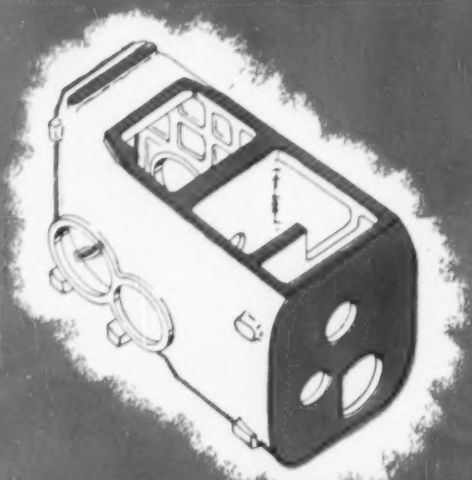
A SUBSIDIARY OF

ABRASIVE AND METAL PRODUCTS CO.

DISTRIBUTORS IN ALL PRINCIPAL CITIES

CUSTOMER SPECIFIED

One of the nation's famous-name farm machinery manufacturers required a big, high-speed, precision production milling machine which would mill several surfaces on huge, 625-lb. transmission case castings in a single setup.

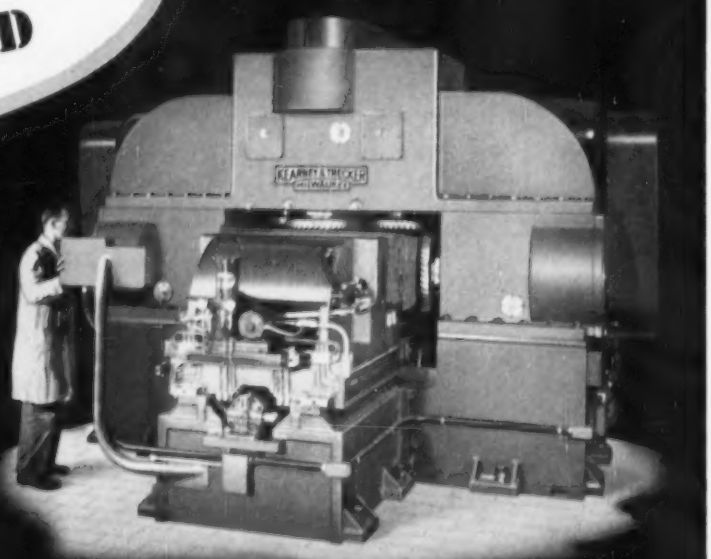


Green indicates machined surfaces on tractor transmission case.

KEARNEY & TRECKER MILWAUKEE DESIGNED

Kearney & Trecker's proposal was accepted and the result was this 44-ton, Five-Spindle Triplex machine which mills top, front and rear surfaces of tractor transmission cases at a rate of 23 pieces per hour.

Two horizontal spindles are mounted in duplex fashion and three vertical spindles on the massive bridge type head. Horizontal spindles, driven by 40-hp motors, carry 22" dia. cutters with 44 blades. Powered by a 50-hp motor, two of the vertical spindles have 22" dia. cutters and the third spindle a 6" dia. cutter with 12 tungsten-carbide blades.



New production efficiency starts with Kearney & Trecker Milwaukee machine tools

Kearney & Trecker automatic production machines perform many operations to exacting accuracies and at lower cost. But most important to you — it's accomplished by combining standard design components with a minimum of special engineering. This means you get the production you want, the economies you need, from job-proven designs with minimum of capital investment.

With more than 50 years' experience in machine design and manufacture, Kearney & Trecker has the all-around ability to meet your production needs. Take advantage of these abilities. They can pay off in lower machining costs and more profits for you. See your Kearney & Trecker Special Machinery Division representative. He'll be glad to help you with your production requirements. Call him today.

For more details on machine illustrated ask for Data Sheet No. 1062. Booklet "Doorway to a proven method for solution of big and small metal-working problems" is also yours for the asking.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

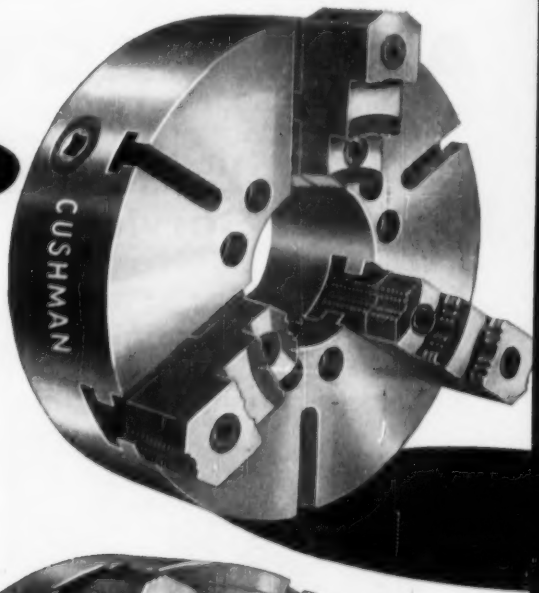
Special Machinery Division

MILWAUKEE 14, WISCONSIN, U.S.A.

Builders of Precision and Production Machine Tools Since 1898

CUSHMAN chucks give Chuck-ability

CHUCK-ABILITY — The ability to SPEED your work . . . ELIMINATE fatigue . . . IMPROVE your products . . . and REDUCE your costs . . . through design and selection of the right work-holding devices.

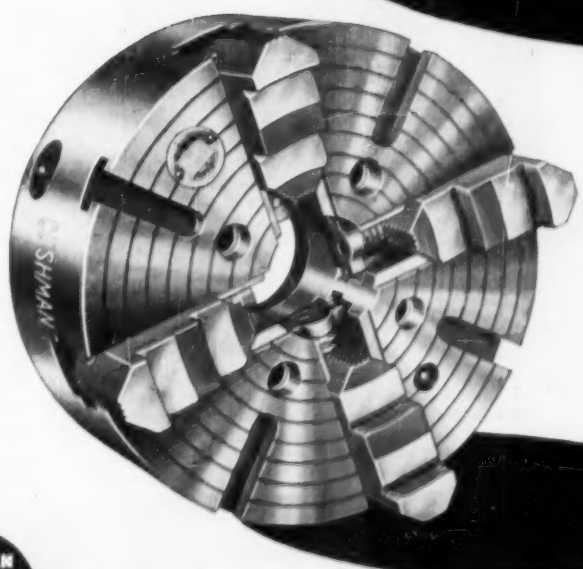


Typical Manually Operated Cushman Chuck-ability Chucks designed for Engine, Tool Room and Manufacturing Lathes.

the key to machining efficiency

If you don't hold it right, you can't machine it efficiently or economically . . . a positive truth for any chucking operation, whether it is the everyday simple routine job, or complex machining operations with many surfaces and close tolerances. Cushman Chucks give you **Chuck-ability** . . . the answer to efficient and economical machining of the new steels and alloys at high spindle speeds.

Chuck-ability is available to you in Cushman's complete line of manually and air operated precision chucks, an invaluable combination of Cushman's exceptionally broad engineering experience plus know-how of the leading chucking specialists. Write today for catalogs fully describing Cushman Chucks. Consult us on all of your work-holding problems . . . standard or special.



THE CUSHMAN CHUCK COMPANY
Hartford 2, Connecticut
a world standard for precision

CUSHMAN CHUCKS . . . *A Product of American Quality, Labor and Materials.*

SEE YOUR INDUSTRIAL DISTRIBUTOR

manufacturers of:
Air Operated Chucks, Cylinders, and Accessory Equipment . . . The Cushman Power Wrench . . . Cushman Manually Operated Chucks and Face Plate Jaws.

4C555A

Square locked head maintains ACCURATE alignment

Box section arm fully encloses driving shaft

100% Anti-friction bearings

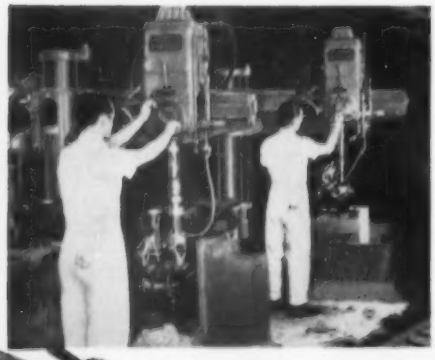
Head in perfect balance on arm

Arm swings with finger tip ease

No driving clutches

LONG LIVED ACCURACY

in this high speed Super Service Radial!



Drilling, Core Drilling and Reaming Alloy Steel Cheek and Counterweights of Aircraft Engine Crankshafts. Reamed holes are held accurate within .0005".

3 and 4 foot arm.

Spindle speeds up to 3500 r.p.m. without belts.

This simplified, very versatile, speedy, accurate and durable machine is rigid and easy to handle.

A distinctive feature is the elimination of spindle driving clutches as forward and reverse rotation is thru a reversing motor . . . very fast for tapping work.

Furnished with 9″ column with 3′ or 4′ arm and 3 HP driving motor.

Get the details. In their range, these machines are most economical and productive.

Write for Bulletin R-21C.

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

CINCINNATI BICKFORD DIVISION

GIDDINGS & LEWIS MACHINE TOOL COMPANY

OAKLEY, CINCINNATI 9, OHIO, U.S.A.

high scorer

. . . and in high speed steels, it's always REX

Crucible's REX® high speed steel always scores highest on performance—as it has for more than a half century. That's because it is consistently sound and uniform in structure . . . with dependable response to heat treatment.

But don't take our word for it. Check REX for yourself—by any test you choose. You'll discover that recent improvements in manufacturing techniques have made it better than ever—why REX is today, as it's always been, *the standard by which all other high speed steels are compared!*

REX is immediately available at all Crucible warehouses, or on prompt mill delivery. For a list of helpful data on REX and other *special steels*, write for a free copy of the "Crucible Publication Catalog." *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Canadian Distributer—Railway & Power Engineering Corp., Ltd.

OAKLEY, CINCINNATI 9, OHIO, U.S.A.

ARMSTRONG

Quality TOOLS

More than meets the eye

There are extra values in ARMSTRONG TOOLS that become apparent only with use.

TOOL SENSE— convenience in use — the most efficient *"tool approach"* built into ARMSTRONG Tool Holders; the balance and *"feel"* of an ARMSTRONG Wrench; the *rigidity* of ARMSTRONG "C" Clamps; the extra *toughness* of ARMSTRONG Lathe Dogs and Eye Bolts; the universal *adaptability* of ARMSTRONG Set-up and Hold-down Tools — the evidence of "tool sense", the understanding of each tool's requirements.

STRENGTH — built into each individual ARMSTRONG TOOL is a safety factor of extra *strength* — *strength* beyond any need, the inherent strength of specially selected materials enhanced by proper heat treatment and hardening.

UNIFORM QUALITY — the uniform quality made possible by modern manufacturing methods, in a specially-built plant equipped with every needed quality control. The name ARMSTRONG with the Arm-and-Hammer Trade Mark is universally recognized as a guarantee of finest quality.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

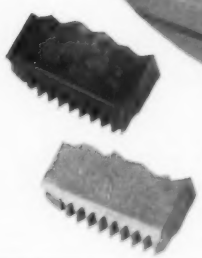
5215 WEST ARMSTRONG AVE. • CHICAGO 30, ILLINOIS

V-B Liquid Honing*

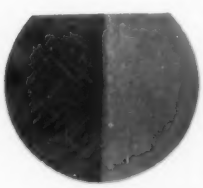
Your Way to Say:

"MOST MODERN PRODUCTION BLASTING EVER DEVELOPED!"

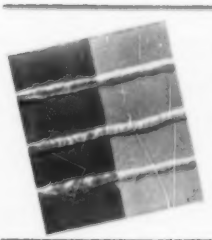
This Machine Should be Processing Your Parts



Vapor Blast Liquid Honing removes heat treat scale faster than conventional tumbling or any other process, and without pitting the steel.



Vapor Blast Liquid Honing blends out grind lines, as shown in the area to the left. The smooth, non-directional surface is ideal for oil flow and unequalled lubrication. Liquid-abrasive action also hones down tiny burrs along the edges of parts like this one.



This unretouched photo of three weld seams shows how efficiently you can remove mill scale, rust, welding and heat discolorations. Top weld is stainless steel; next, copper brazing; bottom, common steel.

For surface conditioning or finishing, a switch to Liquid Honing will save you a superintendent's pay in a year or less. Metals, plastics, ceramics — any material you use — can be Liquid Honed fast and to close tolerance. You get a better production job every time . . . at lower cost and without usual danger to the operator.

Send a sample scale-covered part with a letter describing your problem. Liquid Honing engineers will remove the scale and return the part with their recommendations. No cost to you . . . no obligation.

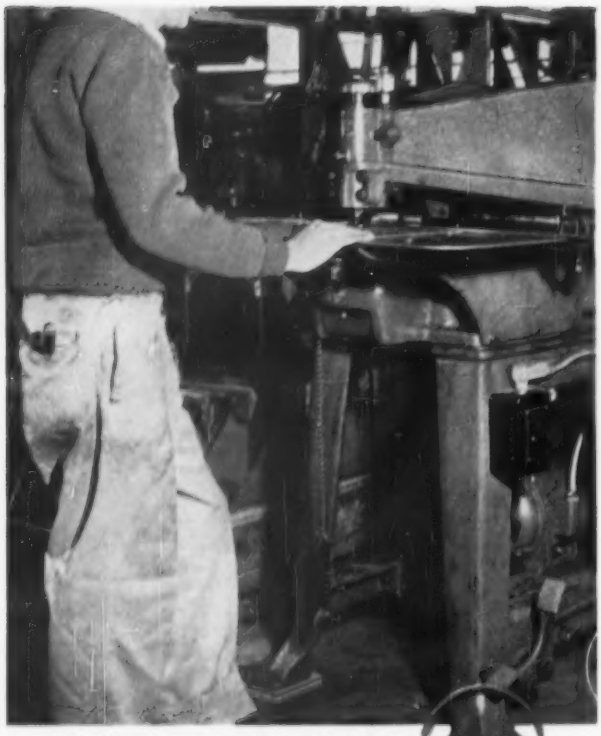
VAPOR V-B BLAST
MILWAUKEE, WISCONSIN

* *Liquid Honing and Vapor Blast are trademarks.*

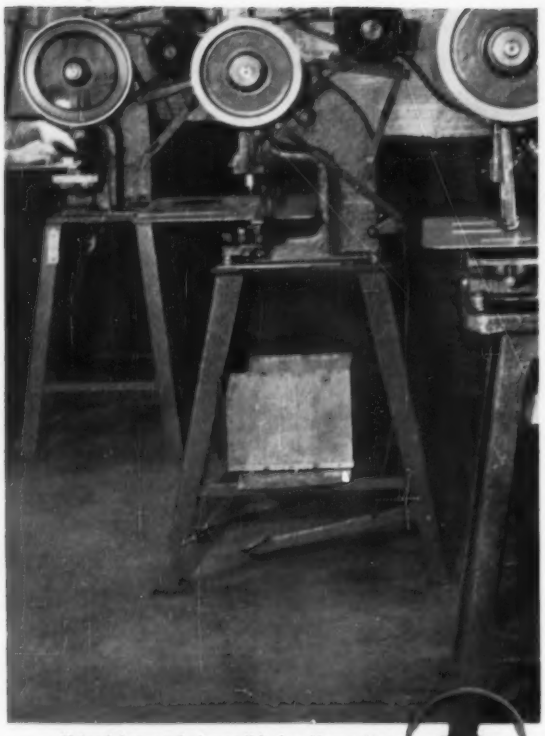
VAPOR BLAST MFG. CO.

3087 WEST ATKINSON AVE. • MILWAUKEE 16, WISCONSIN

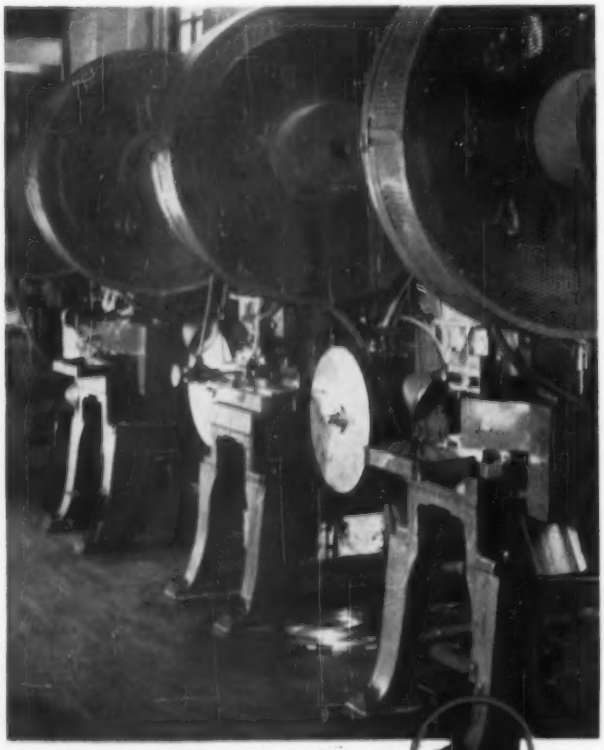
DOLLAR FOR DOLLAR, JOB FOR JOB, NO OTHER SURFACE-CONDITIONING METHOD CAN EQUAL LIQUID HONING



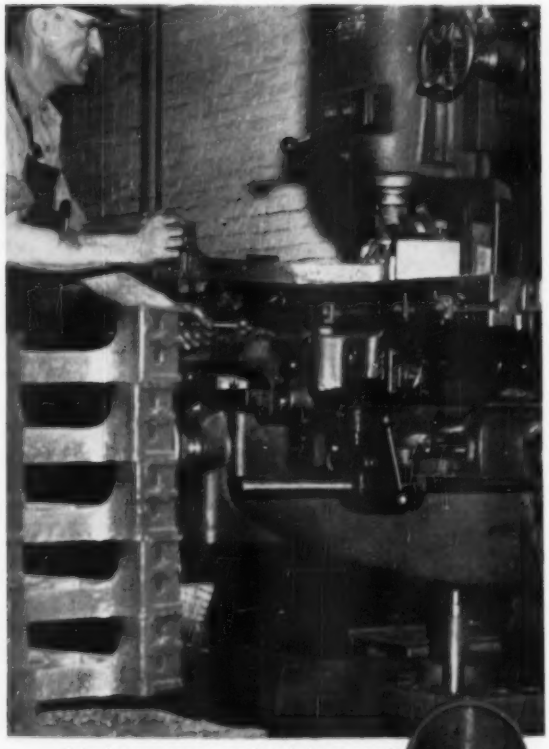
Unisorb eliminates vibration in this machine shop. Machinery is frequently moved, also effecting a big saving in maintenance costs.



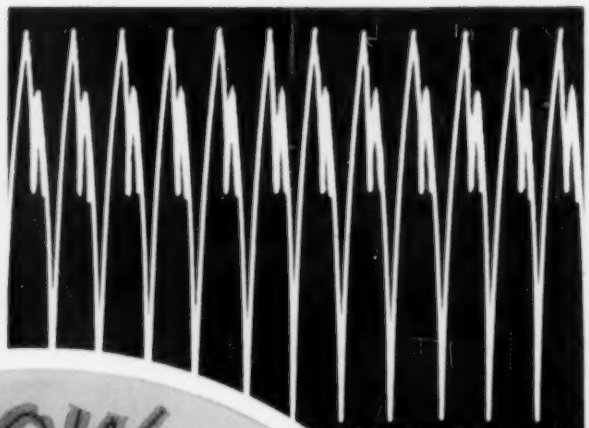
Unisorb has made it possible for this machine company to save 75% in time and labor on installing and positioning machinery.



Punch presses are mounted on *Unisorb* without bolts or lag screws — no tightening or replacement required.



Unisorb has cut average installation time of new machines to two hours at a big electrical manufacturer — saving time and labor.



MACHINES WITHOUT UNISORB

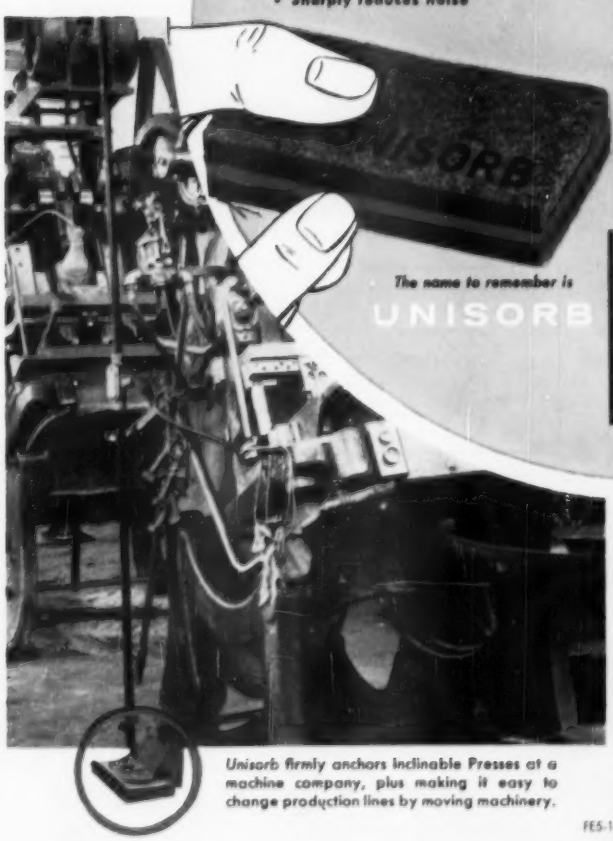
NOW A Special Type of UNISORB for every size Machine

Exclusive red center cushion-control available in loading ranges from 5 to 250 lbs. PSI.

Four types of Unisorb have been developed to speed the installation and drastically cut the vibration of every machine in your plant.

This is how Unisorb works for you . . .

- **Saves up to 60% on installation time**
- **Cuts installation costs up to 30%**
- **Stops up to 85% transmitted vibration — increases machine life and operator efficiency**
- **Eliminates all bolts and lag screws, no drilling or patching. Easy to relocate machinery**
- **Sharply reduces noise**



The name to remember is UNISORB

Be sure you get just the right type, density and firmness for vibration-free anchoring — specify Unisorb. For over twenty years, production men have been using this mount to make their plants a better place to work and more profitable to run. Take advantage of this cost saving the next time you install or move a machine.

Send for Unisorb "Facts" Book

It will give you all the data on what kind of Unisorb to specify for a pay-off in your plant.

the **FELTERS** company
200 SOUTH STREET, BOSTON 11, MASS.
Manufacturers of Felt and Felt products
Offices: New York, Philadelphia, Chicago, Detroit, St. Louis
Sales Representative: San Francisco
Mills: Johnson City, New York; Millbury, Mass.; Jackson, Mich.
Representatives in principal cities throughout the world

Unisorb firmly anchors inclinable Presses at a machine company, plus making it easy to change production lines by moving machinery.

FES-18

MACHINES WITH UNISORB

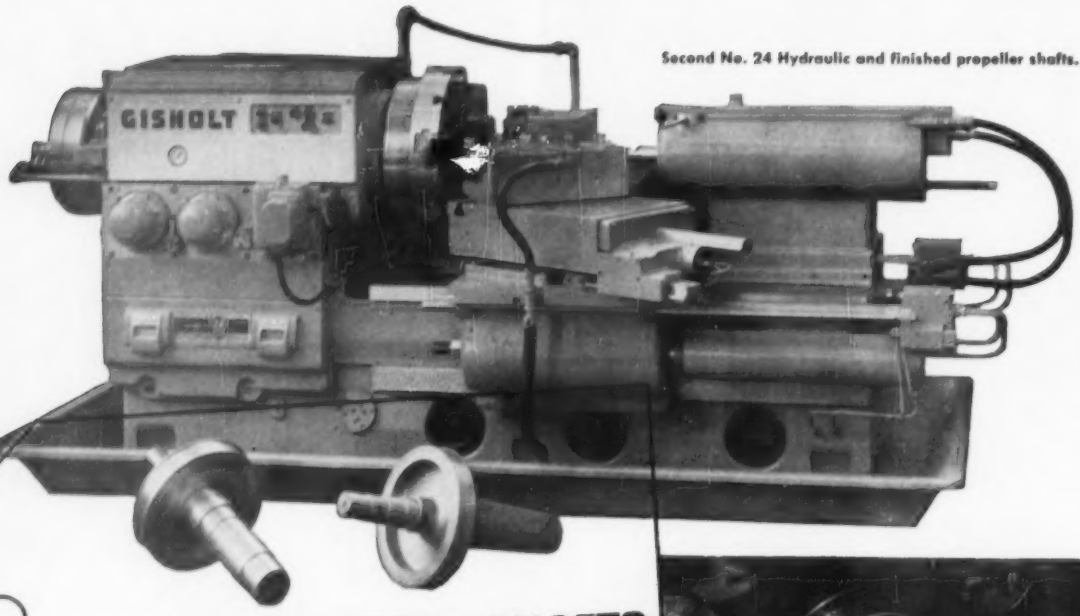
Please send me a copy of FACTS ABOUT ANCHORING YOUR MACHINES WITH UNISORB, at no obligation to me.

Name..... Title.....
(Please print)

Company.....

Address.....

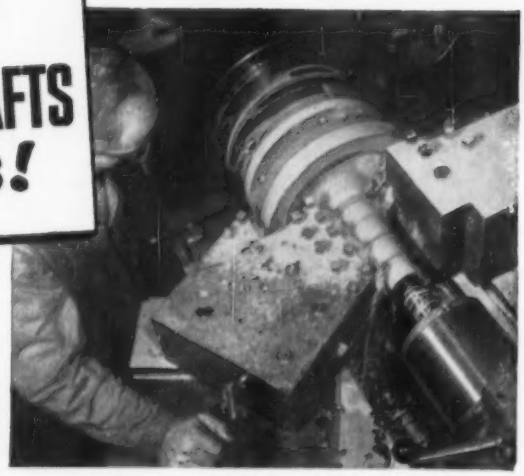
City..... Zone.... State.....



Second No. 24 Hydraulic and finished propeller shafts.

AIRPLANE PROPELLER SHAFTS AT BARGAIN PRICES!

from GISHOLT No. 24 AUTOMATIC LATHES

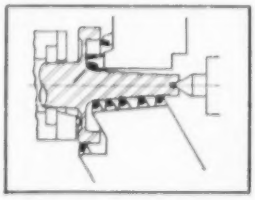


First No. 24 making chips on small end of shaft.

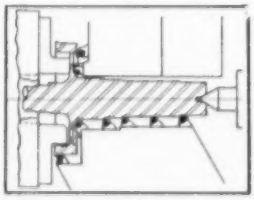
For speed and precision on these hefty drive gear and propeller shafts, production is divided between a pair of Gisholt No. 24 Hydraulic Automatic Lathes. The first machine gets the 275 lb. steel forging for nine different turning, chamfering, and facing operations on the 16" gear blank and five-shaft diameters. 12 minutes later, the part moves to the second machine where nine tools perform similar work on the other side of the flange. Time again is 12 minutes.

Together, the two No. 24 Hydraulics remove a total of 75 lbs. of material. One man operates both machines. Another tough job handled to perfection by these high production machines.

The Gisholt No. 24 Hydraulic, like the famed smaller No. 12 combines ease of setup with exceptional speed and accuracy—all with fully automatic operation that means low costs on any job. If you have work up to 24" diameter, you should have full details on the rugged, powerful, No. 24 Automatic.



Tool arrangement for first operation.



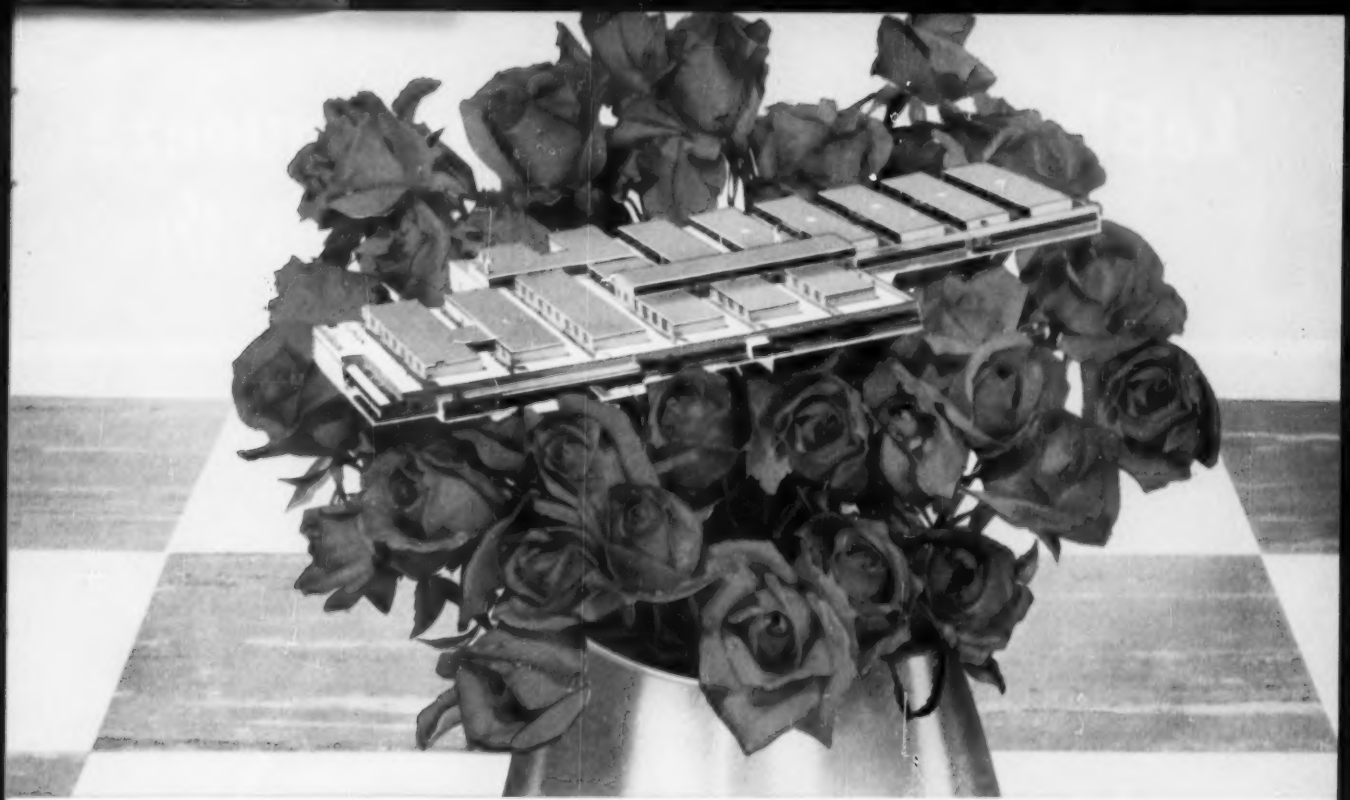
Tool arrangement for second operation.

THE GISHOLT ROUND TABLE

represents the collective experience of specialists in machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY Madison 10, Wisconsin

TURRET LATHES · AUTOMATIC LATHES · SUPERFINISHERS · BALANCERS · SPECIAL MACHINES



Want to put your plant on a bed of roses?

You can—easily! Switch to CIMCOOL®, the radically new and different cutting fluid that has become, in just a few years, the largest selling chemical cutting fluid in the world.

Here are just three of many reasons why CIMCOOL Concentrate gets all the bouquets:

- **CIMCOOL LOWERS COSTS** because it's longer lasting in machines. Thus, it reduces downtime and cuts labor costs for cleaning and changing.
- **CIMCOOL INCREASES TOOL LIFE** because of its chemical lubricity. It permits faster speeds and feeds, for it combines friction reduction and cooling capacity in a degree never before attained by old-fashioned coolants.
- **CIMCOOL IS CLEAN,** doesn't soil clothing or hands. It contains no skin irritants. It leaves no slippery film on shoes, floor, machine or work. It can't smoke, can't burn, and virtually eliminates rancidity and foul odors.

So if you want to see your production picture take on a rosy hue, put CIMCOOL on the job in your plant. Let us give you the full details on CIMCOOL Standard Concentrate—and on the entire family of CIMCOOL Cutting Fluids. Just contact us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Wire, write or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Company, Cincinnati 9, Ohio.

®Trade Mark Reg. U.S. Pat. Off.

CIMCOOL CUTTING FLUIDS

CIMCOOL **Concentrate**—The famous pink fluid which still covers 85% of all metal cutting jobs. Effective, economical and clean.

CIMCOOL **Tapping Compound**—Permits the use of highest tapping speeds and increases tap life amazingly.

CIMPLUS The transparent grinding fluid with exceptional rust control. Also used for machining cast iron and as a water conditioner with CIMCOOL Concentrate.

CIMCUT **Base Additive**—For jobs requiring an oil-base cutting fluid. Added to mineral oils, it gives an economical mix for higher speeds and feeds.

CIMCOOL **Bactericide** — The most effective agent yet developed to overcome rancidity and foul odors.

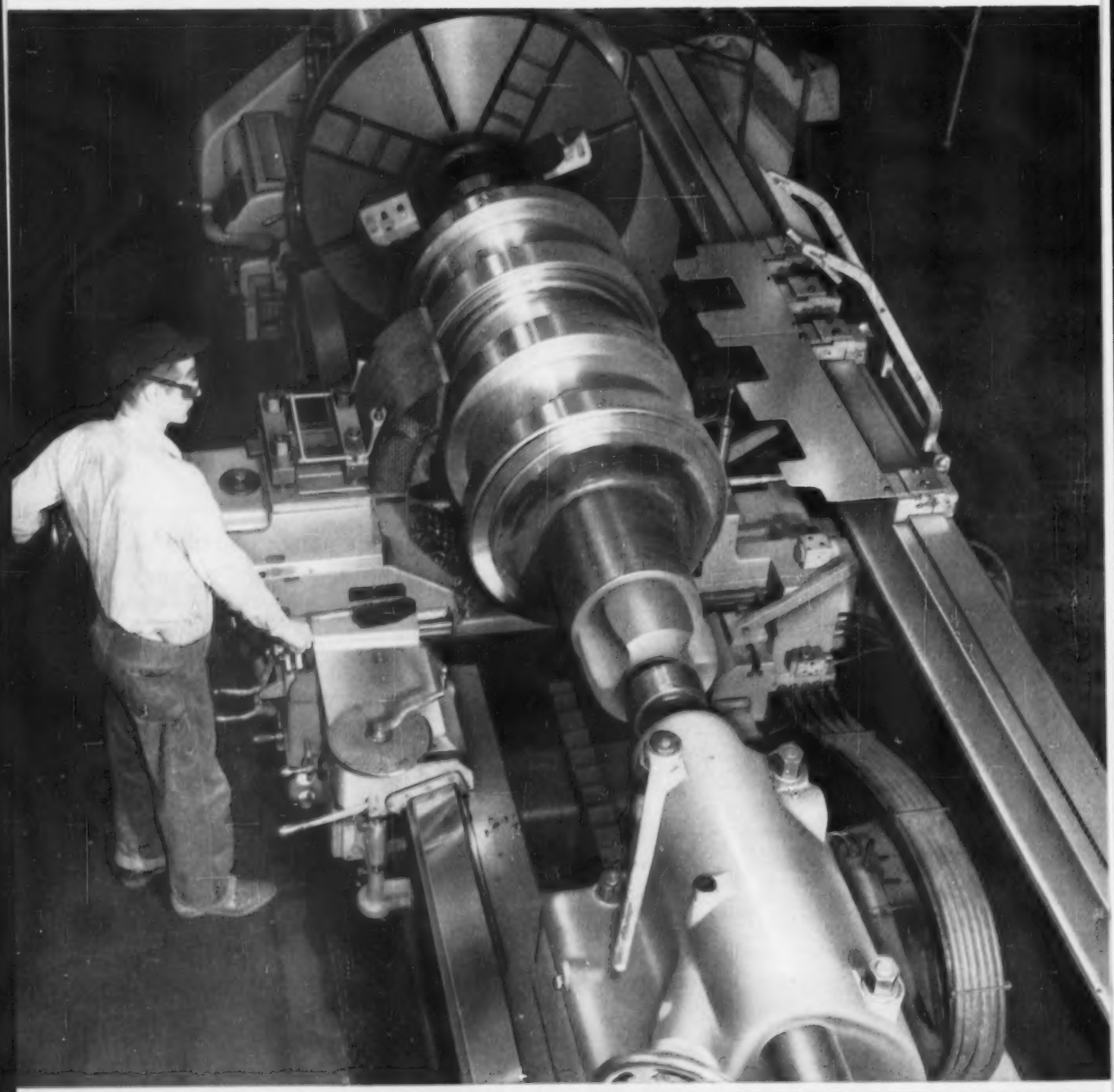
CIMCOOL **Machine Cleaner** — The two-phase non-corrosive cleaner that removes grit, dirt, slime and oil.

CIMCOOL Cutting Fluids

for 100% of all metal cutting jobs

PRODUCTION-PROVED PRODUCTS OF THE CINCINNATI MILLING MACHINE CO.

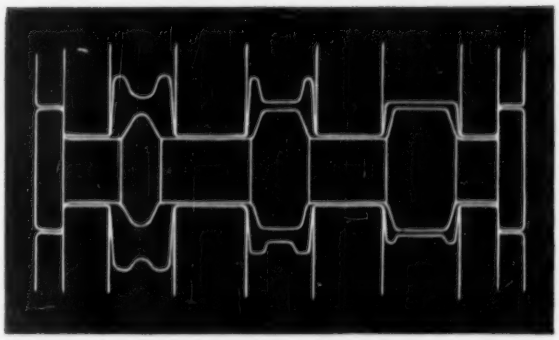
LeBlond Lathe eases cost squeeze ...on rolls that



A set of Shape rolls of 30½" dia. x 51" body cast alloy semi-steel are turned to .005" tolerance in 94 hours on this 50" LeBlond Roll Contouring Lathe. Set-up time—¼ hour. Clamped-on and brazed-on carbide tips are used at 48 rpm, .040 ipr feed. Conventional roll lathe took 245 hours for the same set of rolls.

squeeze channels from blooms

U. S. Steel Lops 151 Hours Off 245-Hour Roll-Turning Job.



Typical roughing rolls for 8" channel

Every day at U. S. Steel's Clairton Works, Clairton, Pa., miles of "hotter-than-orange" steel are squeezed through the passes of rolls like these for reduction, elongation, shaping. They come out as finished structural steel for the "jungle-gym" frameworks of modern buildings. Turning these costly shape rolls with their steep-angle contours used to keep a lathe running *245 hours on a set of roughing rolls* at U. S. Steel. Tool life was short and the job required highly skilled operators. Stepped-up schedules called for a new solution to this tough-nut production problem.

A LeBlond 50" Roll Contouring Lathe, as recommended by Pittsburgh Distributor, Barney Machinery Co., immediately slashed the 245-hour turning time by an astonishing 61.7%. Now U. S. Steel *saves 151 hours on one set of roughing rolls*—more than enough time to turn out two more just like it. Tool life is greatly improved and less experienced operators can handle the work.

The 50" LeBlond Roll Contouring Lathe is equipped with two-directional hydraulic tracing. A single valve automatically controls two hydraulic motors for cross and length feed. A stylus follows a flat template mounted at the back of the lathe. Feed and speed can be varied during a cut without leaving a tool mark. For roughing, hydraulic cross feed can be by-passed and length feed used separately. This enables operator to cross feed manually, use template as length stop. Mechanical power rapid traverse to carriage and cross slide is also provided. All controls are located conveniently at the apron. The lathe uses a 40 constant horsepower DC motor, has nine speed changes in the headstock, delivers infinitely variable speeds from 1 to 165 rpm.

Whether your turning jobs involve specialized production like roll-turning, or call for high precision, high production—investigate LeBlond's complete line of 76 lathe models. LeBlond engineers will help you get a better turning job, faster. Write today or see your nearby LeBlond Distributor.

Ask for complete information on Roll Contouring Lathes in 25", 32", 40" and 50" sizes.

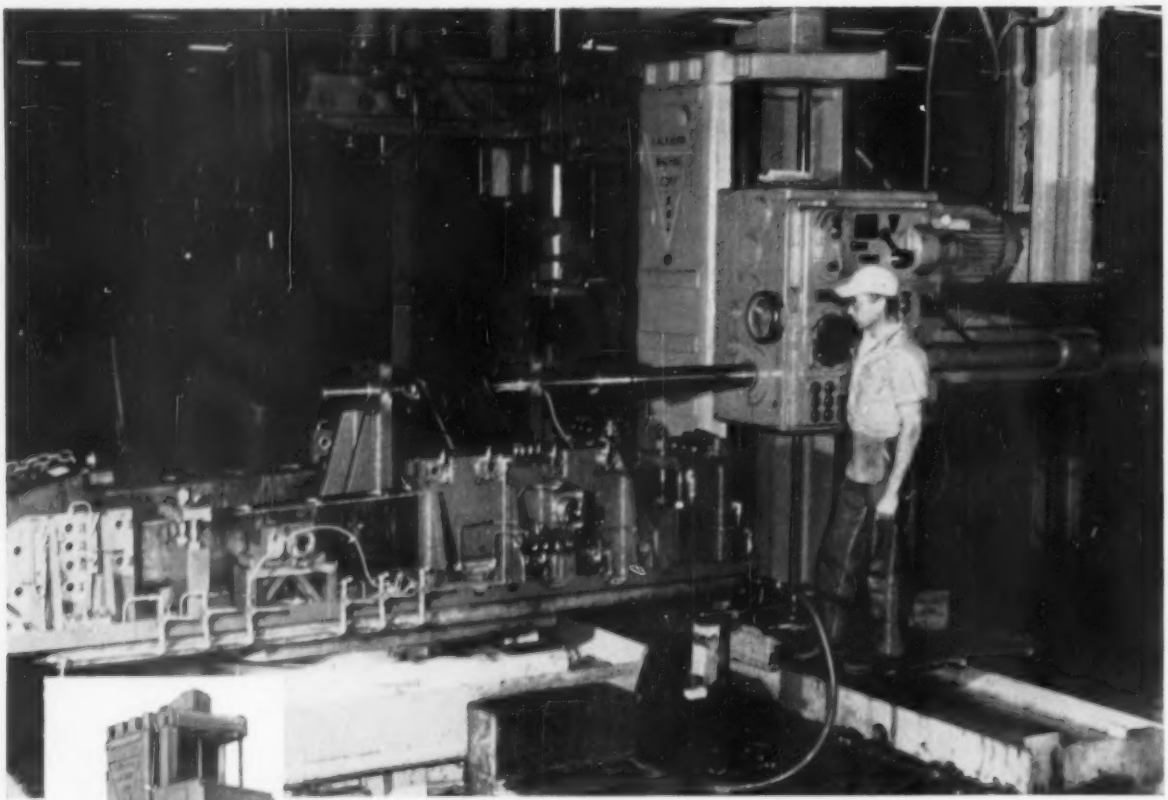
Turned faster by

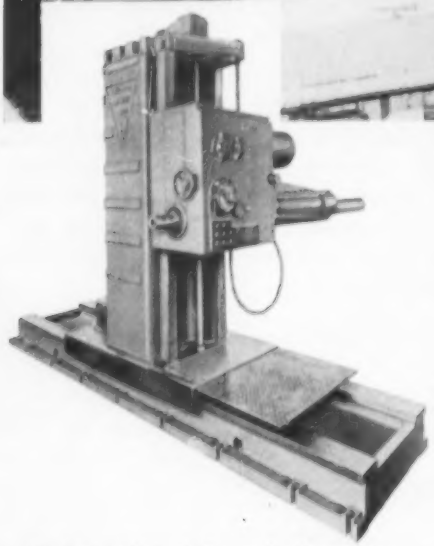
LeBLOND of Cincinnati

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 66 YEARS*

same set of rolls.





A JOB THAT ONLY A *Kaukauna*

HORIZONTAL DRILLING, TAPPING AND BORING MACHINE

CAN DO—*faster, easier, at lower production cost*

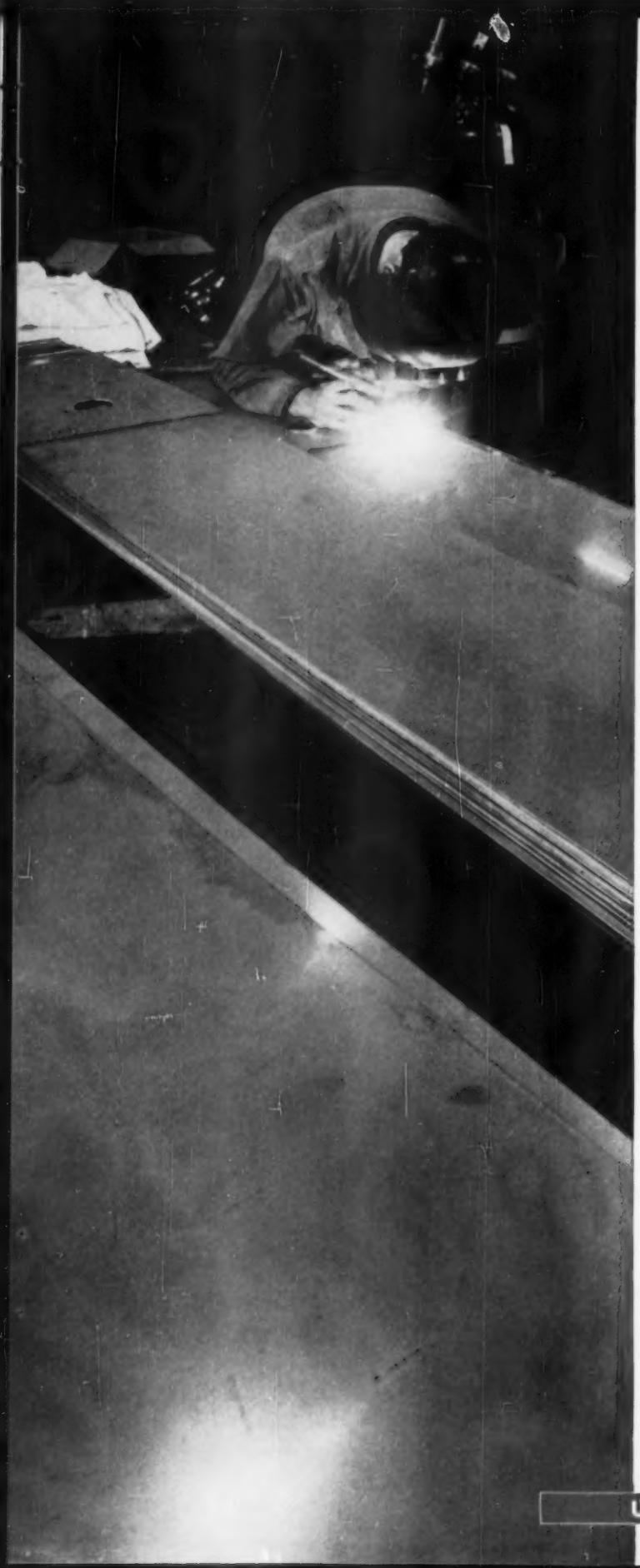
All four sides of the main frame for a crawler type diesel tractor are drilled and tapped, reamed or chamfered, on the Kaukauna Model 3040 Horizontal Drilling, Tapping and Boring Machine at the plant of a nationally known manufacturer of farm equipment *with one setup.* The tractor frame is approximately 10 ft. long by 4 ft. wide and therefore the Model 3040 permits a full 120 in. travel of the column on the runway. In this setup, the tractor frame is dropped by overhead crane into a fixture on a power driven rotary table located in front of the Kaukauna and the production operation is simple, accurate and rapid:

Set up frame in fixture.
Drill, Tap and Chamfer sixteen holes.
Index table 90° to second side.
Drill, Chamfer and Tap six holes.
Index table 90° to third side.
Drill sixteen holes; drill and ream two dowel holes.
Index table 90° to fourth side.
Drill, Chamfer and Tap six holes.
Remove frame from fixture.

Convenient push button controls for complete machine operation are located at the front of the headstock. The unusual 42" spindle travel eliminates any need for tool extensions and insures maximum tool rigidity. Operator working conditions are ideal because the usual pit or platform is not necessary and crane time is kept to an absolute minimum.

Learn now what a Kaukauna will do for you by time estimates on your various jobs. Consult your nearest Kaukauna distributor, or phone, wire or write direct.

KAUKAUNA MACHINE & FOUNDRY DIVISION
GIDDINGS & LEWIS MACHINE TOOL COMPANY
KAUKAUNA, WISCONSIN, U.S.A. TELEPHONE ROCKWELL 6-4631 CABLE KAUMACH



Stainless Steel
welding information:

how to get strong welds in thin sections

Thin Stainless Steel sections can be easily welded without flux if you use an inert gas-shielded electric arc procedure. The welder in the picture is using an argon atmosphere. It shields the welding zone from slag impurities, eliminates fumes and spatter, and produces a clean, dense weld.

The process is especially suited for USS Stainless Steel grades 301, 302, 303, 305, 316, 317, 321, 347, and 410, in thicknesses from .025 to .25 inch. The tungsten electrode used is not consumed, and it will not pick up carbon. If filler metal is needed, it can be the same as the parent metal. There is little distortion, even in thin sections, when properly jigged.

If welding rod is used, it should be of the proper composition, and all the usual joints can be made easily. Either DC or AC current can be used, but direct current gives greater penetration and speed. Surfaces should be clean, and you should use a back-up bar, or a mixture of Stainless Steel flux and shellac on the under side.

To develop the very maximum strength and corrosion resistance, the welds should be annealed—although this is not always necessary. The subject is covered fully in our comprehensive Stainless Steel "Fabrication" book. Write on your company letterhead for your copy to: United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

If you'd like, we'll have a representative call and discuss your special shop problems.

UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS STAINLESS STEEL

SHEETS • STRIP • PLATES • BARS • BILLETS
PIPE • TUBES • WIRE • SPECIAL SECTIONS

UNITED STATES STEEL

DEID sets the standard for

for Quality Reamers

L&I

stands alone

L&I

The Reamer Specialists

LAVALLEE & IDE, INC.

CHICOPEE, MASS.

Backlash

SEND LETTERS TO:
BACKLASH EDITOR American Machinist
330 W 42nd ST, N Y 36, N Y

What About Me?

Mr Burnham Finney's editorial, "1966" (*AM*—Mar 26 '56, p95) makes some interesting points. At our present rate of progress it does not seem unlikely that the average skilled worker will be making $8000 a year by that time.

But I, and thousands more like me, will be in retirement when that day comes. We shall be trying to exist on pensions earned largely on a $4000 to $6000 a year income. The highly paid worker may indeed have an automated home, color television, and all the other things that go to make comfortable living. We shall be hard put to it to pay the taxes on our modest old-fashioned houses.

It is not a new problem. Through all the past generations, our standard of living has increased steadily, and almost invariably the son has earned more than his father. But the change has been gradual, and the older man's fewer needs have been enough to compensate for the difference in income. But if a mere ten years are to effect so great a change as a jump from $5600 to $8000, the results for the older man are going to be disastrous. Our investments and annuities are going to seem pitifully small, and what would be comfortable retirement income today will not be enough to keep us at a subsistence level. It is a matter that demands deep consideration. Industry cannot be expected to make up the difference, so it looks like a job for the government.

J W McCulloch
Chicago

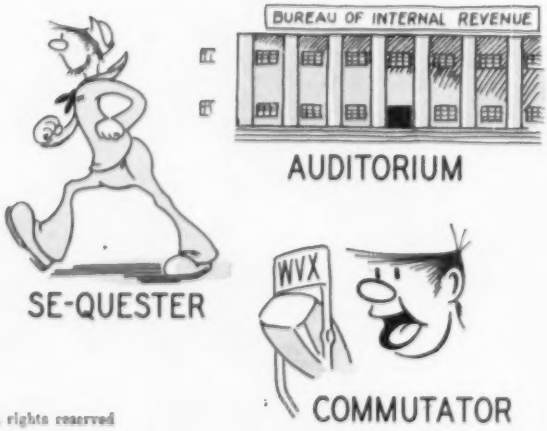
Good Old Watertown

The article on the bore-hardness testing device made at Watertown Arsenal (*AM*—Feb 27 '56, p116) is of particular interest to me, not so much the design itself as the fact that it was developed at the arsenal. It may not be generally known outside of New England that the arsenal has been one of the most progressive institutions in the country for many years. Its testing machines were made available to industry in that area many years ago, and it had one of the biggest and best X-ray laboratories in the country early in the development of that very essential method of checking on the soundness of castings.

I first visited Watertown in 1896 and obtained an interesting article on machining large guns. I visited often before and after WW I, when

GRINETICS

By D G SMITH



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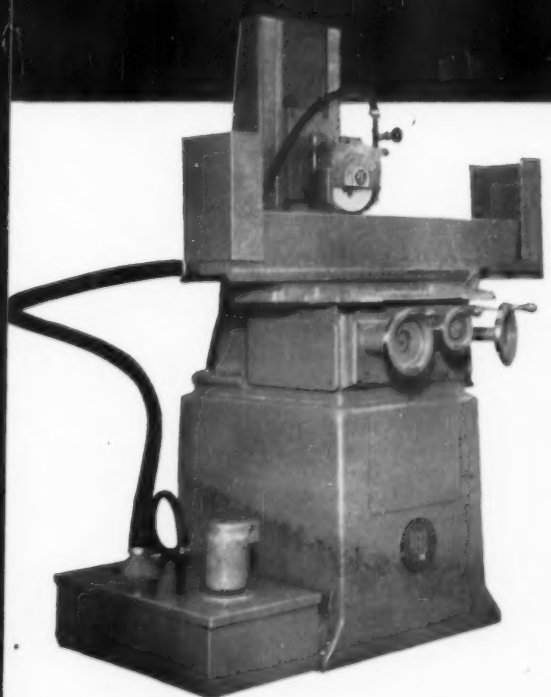
REID sets the standard for precision surface grinding...



MODEL 618H convenient finger-tip level controls for all operations make this grinder the favorite of the toolroom for the finest tool and die grinding. Accessories, including Cool-Grind or wet grinding attachments, magnetic chucks and form dressers give extreme versatility for all operations.

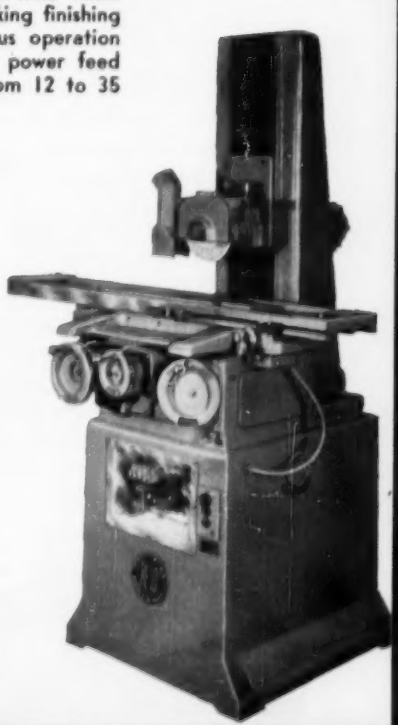
MODEL 618VL designed for precision grinding to the finest tolerances with superior surface finish . . . rugged construction and painstaking finishing give true dependability for continuous operation with minimum maintenance. Features power feed table with traverse speed variable from 12 to 35 feet per minute.

SPECIFICATIONS

CAPACITY: 6" wide, 18" long, 17¼" high from spindle center to table.
WORKTABLE: 51" x 8" overall.
FEED RANGE: Elevating hand wheel (r.) graduated to .0005" (optional, vernier to .0001"); cross feed to .001"; power cross feed adjustable .006" to .100" at either or both ends of table reverse.
GRINDING HEAD: with 3" opening for standard 1 h.p. cartridge type motorized spindle. Wheel size: 7" x ½" x 1¼".
FLOOR SPACE: 71" x 43½"
WEIGHT: 2100 lbs. net

Write for Bulletin 618-1

Photo courtesy o Robertson Mfg., C



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BEVERLY MASSACHUSETTS

LEADERS IN INDUSTRY MARK WITH NOBLEWEST

ROLL-O-MARK

MULTI-PURPOSE ALL-PNEUMATIC MARKING MACHINE

1 *Roll-Marking into Surface of Piston*
2 *Serial Numbering into Metal Shaft*
3 *Permanent Marking and Graduating into Metal Collar*

Model 50P1

This multi-purpose Roll-O-Mark can be set up faster . . . tooled up easier . . . accommodates attachments more readily than any other marking machine. With all-pneumatic operation, no motor or separate power unit is required. Simply connect to the shop's air line—air is used *only* when in operation. This multi-purpose metal marking machine offers many other advantages such as—5" die slide stroke . . . open throat design . . . hand wheel for rapid table elevation . . . independent control for set-up.

Whatever your needs for metal marking, Noblewest makes the machines, marking dies, and work-holding fixtures for doing the complete job faster, better, at lower cost. And remember, Noblewest Roll-Marking is *permanent* marking—*good for the life of your product.* There is a Noblewest Representative near you. Write Noble & Westbrook Manufacturing Company, 17 Westbrook Street, East Hartford 8, Connecticut.

MARKING MACHINES • MARKING TOOLS

they were making field artillery guns from castings. As chairman of the committee for the Ordnance Dept, I saw it for the last time in 1944.

Before the first war, I found Col Wheeler and his assistant, Major Williams, very progressive. Williams late went to Fort Hancock and was General Pershing's artillery head with the first contingent that went to France in 1917.

It was General Williams by the time he came back from France in 1918 to straighten out the tangled ends of ordnance in Washington, and I had the pleasure of working with him until the end of the war.

Watertown Arsenal has been a very efficient institution for many years, and the latest news from there indicates that it is still in the same desirable condition.

Fred H Colvin
Point Pleasant, NJ

Ouch, My Ulcers

Nobody will deny that Coca Cola is an international institution. You can get it anywhere in the world, and there is no doubt that it refreshes. But has it turned out to be the universal solvent?

Steve Morone
Newark, N J

Which Transducer?

Your Special Report on Ultrasonics (*AM*—Jan 2 '56 p 97) indicates that difficulties are being encountered in manufacturing titanates in large sizes. Large installations using titanate or magnetostrictive transducers usually utilize a mosaic of relatively small transducers. There is no limitation whatsoever on the size of titanate transducer mosaics. We have used radiating areas up to 10 ft, and anticipate being able to use larger areas, as required. We utilize barium titanate at 40 kc. However, several other companies use it at 20 kc and lower frequencies.

The problem of surface erosion on the transducer exists with both nickel and barium titanate transducers. Both types usually have a radiating plate attached to the active element. Most barium titanate transducers are now housed in stainless steel housings.

Failures of transducers in operation have not been due to the limitation of the ultimate strength of the material, but to mechanical design,

BEVERLY MASSACHUSETTS

surface erosion, and similar factors.

No truly significant data are available on the efficiency of either transducer type. However, theoretical considerations indicate that barium titanate transducers of proper design should be more efficient. This is borne out by the fact that commercial equipment using barium titanate transducers usually provides larger radiating surfaces, at the same frequency and power input to the transducer.

Peter K Bloch, vice president
Branson Ultrasonic Co
Stamford, Conn

Let's Smooth the Road

I quite agree with Mr Charles Whitelaw (*AM*—Mar 26 '56, p77) that our engineer licensing regulations are completely out of date and urgently in need of revision, but I do not agree with his ideas as to Russian education. From reports published recently from reliable sources it appears that engineering students receive a most comprehensive education in Russian universities.

The major difference seems to lie in the fact that their students are paid regular salaries, sufficient to cover their tuition, books, and living expenses. American students, on the other hand, often have to quit college after one or two years for financial reasons, and many brilliant high-school students must forego all hope of college training for the same reasons. There appears also to be a vast difference in the mental attitude of the Russian student. He goes to school to study, and all other activities are subordinated to the great objective of making a fine scholastic record. Admittedly there is a certain compulsion; the failure is probably relegated to the ranks of unskilled labor, from which he may never escape. The American student appears to place education second, and to concentrate more on good time and the making of friendships and "contacts" that will stand him in good stead later in life. Furthermore, he knows that if he fails he still stands a pretty good chance of getting a well paid job in some other field.

I am afraid Mr Whitelaw is falling into the common error of underestimating the enemy—always a dangerous attitude. Let us rather take a leaf from their book and make it easier for our boys to attend college without worrying about where their next meal is coming from.

Robert Carlisle
Los Angeles

NEW SERIES B

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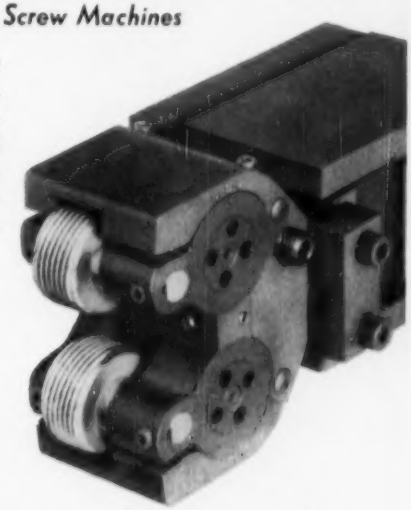
Thread Rolling Attachments

Provide Greater Versatility . . .

in THREAD and FORM ROLLING APPLICATIONS

on Automatic Screw Machines

A multi-purpose tool of wide range for rolling machine screw threads, straight and taper pipe threads (including dryseal), annular rings, oil grooves, knurling and other cold forming operations. Eliminates secondary operations by rolling behind shoulders.



- For over 100 different single and multiple screw machines
- Adapters for more than 300 cross-slide applications
- Easy to set up and operate
- Simple precision matching with pre-matched rolls
- Dovetail clamping arrangement simplifies setup by permitting head to be removed from adapter

SELF-COMPENSATING ROLL ACTION simplifies setup, provides longer roll life and reduces down time to a minimum. The ***side and alignment compensators*** ease undesirable side pressures on the rolls and assure smooth contact and withdrawal from the work. The ***advance compensator*** allows rolls of the same diameter to be used and permits either roll to contact the work first.

FOUR STANDARD SIZES

Model No.	Complete Diameter Range	*Pipe Threads That May Be Rolled	Approximate Number of Common Screw Threads That May Be Rolled
B 10	0-5/8"	7	80
B 13	1/8"-1 3/16"	9	90
B 18	1/4"-1 1/8"	15	105
B 36	3/8"-2 1/4"	18	185

*Straight and Taper Pipe Threads, including Dryseal (NPTF). Change may be made from Straight to Taper Threading by changing rolls only. No other equipment is necessary.

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REED SERVICE PERSONNEL AVAILABLE to assist with initial installation. Application and Operating Instruction Book supplied with each attachment. Complete satisfaction assured.

Write for Attachment Bulletin B-1

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make radius measuring easy

Ask your men why they're so keen about these new No. 167 Starrett Radius Gages. They'll give you a run-down like this:

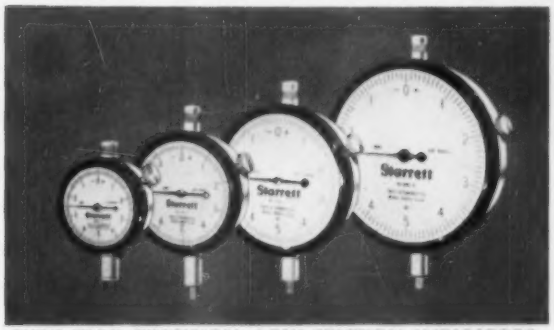
Individual gages — easier to use, less chance of error. *Five gaging surfaces on each* — to handle any convex or concave radii. *Stainless steel* with satin no-glare finish — to make them rustproof and stain-proof. *Sizes from 1/64 to 1/2"* — in six convenient sets.

For seventy-five years tool buyers and users have preferred Starrett tools for one very obvious reason . . . because they are measurably better. You can count on the same extra value and performance when you specify Starrett dial indicators and gages, steel tapes, hacksaws, hole saws, band saws, band knives and precision ground die and flat stock.

Starrett tools are always available through a convenient and reliable source of supply — your INDUSTRIAL SUPPLY DISTRIBUTOR.

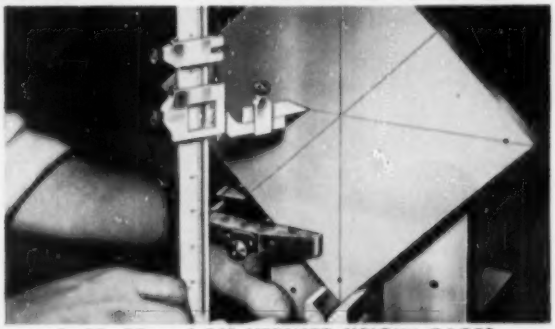
WHEN YOU MEAN PRECISION YOU SAY STARRETT

OTHER NEW STARRETT PRODUCTS



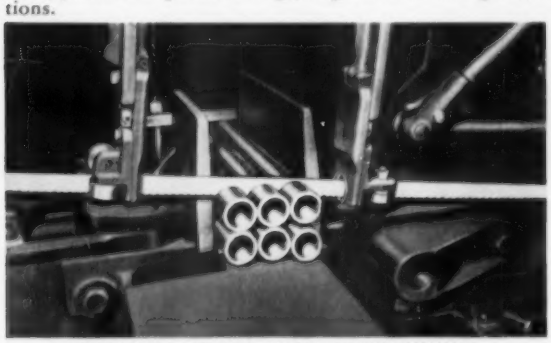
NEW HIGH-PRECISION, LOW-FRICTION INDICATORS

Featuring simplified construction; easy reading, egg-shell finish dials; no-glare Satin Chrome Finish on case; black bezel. The complete line with 140 models to meet all requirements includes regular or nonshock types, balanced or continuous dials, jeweled or plain bearings, English or Metric graduations.



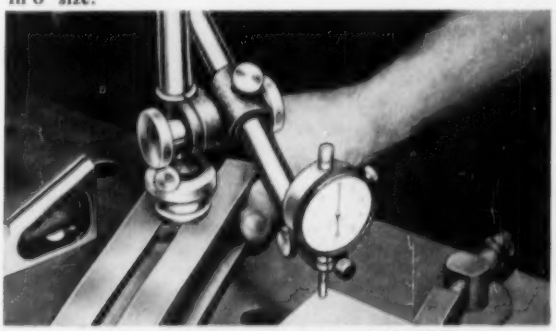
6, 12, 18 and 24" VERNIER HEIGHT GAGES

Starrett Vernier height gages are standard equipment in tool rooms and inspection departments for layout, jig and fixture work and precision inspection. No. 454 (shown above) is available in 12", 18" and 24" sizes. 36" and 48" sizes furnished on special order. No. 354 with slotted base available in 6" size.



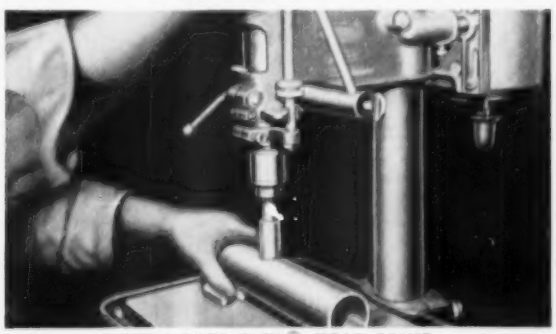
HACKSAWS, BAND SAWS, BAND KNIVES

Now production-proved to give faster cutting, longer blade life. Starrett wavy set band saw blade (pictured) makes short work of gang cutting pipes. Starrett-engineered blade construction means uniform cutting action, less chance of blade breakage or tooth stripping.



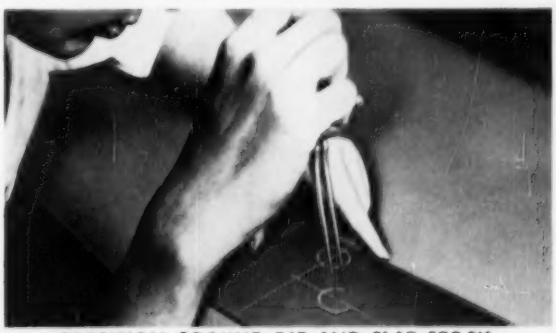
NEW HEAVY DUTY TEST INDICATOR

No. 675 with extra rigid construction has universal adjustment for quick positioning. 10" base, $10\frac{1}{2}$" base post and $8\frac{3}{4}$" gage rod give it unusual stability and working range. Indicator normally furnished reads 0-25-0, graduated .0005", range .125". Other indicators available.



NEW SAFE-FLEX® HOLE SAWS

Use these new double-welded, shatterproof hole saws for cutting large diameter holes in metal, plastic, wood. Interchangeable arbors hold a wide range of saw sizes. Shanks fit portable power tools, lathes, drill presses, etc.



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Over 1000 sizes precision ground to Starrett standards of accuracy. Available in oil, oil and water, water or air hardening types. To save valuable man and machine hours, just "lay it out . . . and saw it out."

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Danly's new "Leadership Line" of die sets and diemaker's supplies is a major development in the stamping industry -- certain to affect every toolroom and die shop in the country.

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DANLY MACHINE SPECIALTIES, INC.

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Spot News of Metalworking...

- **A 46-hr week in Russian industry was put into effect on March 10,** a reduction of 2 hr from the previous standard. Same amount of production as formerly is expected from workers. Work-week now is 8 hr a day, Monday through Friday, and 6 hr on Saturday. Soviet leaders plan for a 42-hr week by 1960.

- **Research program on development of new high-temperature alloys** containing tungsten has reached point at which two jet engine builders have given the "go ahead" signal to test them.

Lighter metal shield that will not become radioactive to replace lead shield now used on nuclear engines is to be developed by Lockheed and Air Force in joint project on nuclear-powered aircraft to be centered in Dawson County, Georgia. Project is said to include an underground railway system. Actual production of the plane will be at Lockheed's Marietta, Ga, plant.

- **Plastic dies are to be tested in actual production** to see how long they will last by a prominent automobile maker. They are being used mainly to speed the start of new-model manufacture. The test is a secondary factor, but one that will be watched with keen interest.

Successful method of plating titanium has been developed by midwestern manufacturer. Initial coating is nickel followed by plating of chromium. Plane landing gear is reported to be one of the applications.

- **Tool and die making costs are soaring** because skilled men are hard to get and know it. Good men are asking and receiving upwards of 20 cents an hour above the union scale.

- **Union backing for automation has been given** by the Federation of German Trade Unions in a conference called by the executive committee of the union at Dusseldorf and attended by delegates of the West German government, of the various political parties and of the Chambers of Commerce. Reason: It is in the interest of the national economy and persons employed.

- **New use of steel castings for spring hangers in the Chevrolet car** leads steel castings people to believe that it opens the way for more applications of their material in the automobile industry.

- **United Automobile Workers' National Aircraft Division has donated $10,000** to members of International Association of Machinists on strike at Republic Aviation. The two unions, already operating under a mutual-aid, no-raiding agreement, are moving closer together in AFL-CIO's new Industrial Union Department on collective bargaining strategy.

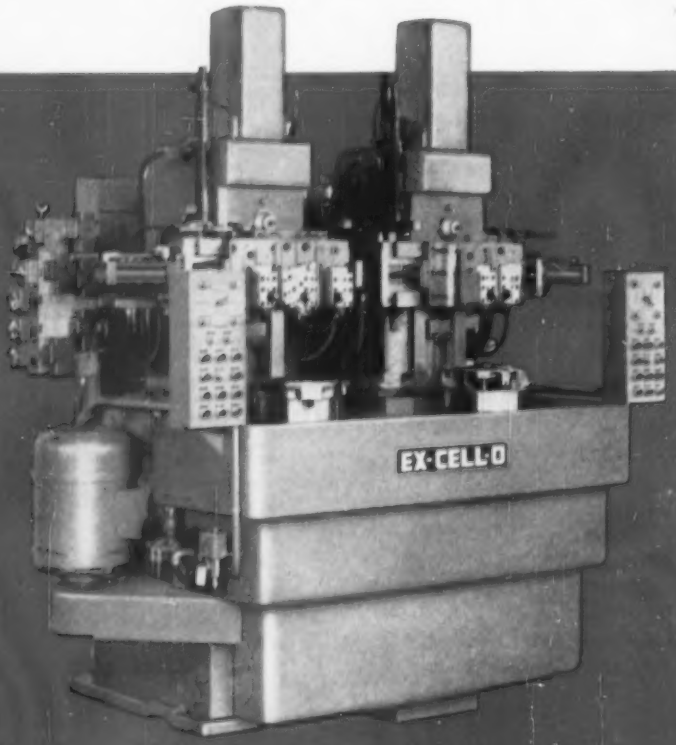
- **Plan to help U S companies keep up with latest European developments** in mechanical, electrical, and chemical engineering has been extended by Armour Research Foundation to include metallurgy. "European Technical Observation Group" is being set up to service 20 non-competing firms. More than half the required sponsors have been signed.

New, Flexible

EX-CELL-O 2-STATION VERTICAL..

XLO
EX-CELL-O for PRECISION

PERFORMS VARIETY OF PRECISION OPERATIONS



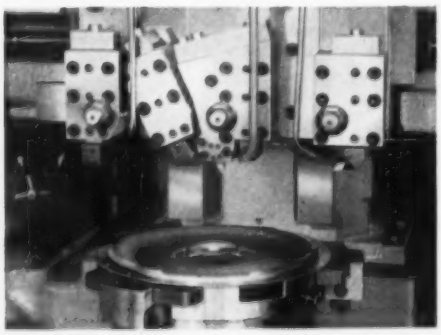
EX-CELL-O STYLE 432 VERTICAL PRECISION BORING MACHINE has two independent hydraulic systems. No cams to change.

The Ex-Cell-O Style 432 completes the operations on both sides of this transmission torque converter cover in one machine cycle.

Ex-Cell-O's new Style 432 Vertical Precision Boring Machine was designed to speed production *where flexibility is essential.* Vertical construction means convenience in loading and unloading parts, also ease in adjusting and changing tools. Precision turning, boring, facing, grooving, and chamfering are performed alone, or in any combination.

Tool one station for operations on one side of a part; tool the other station for different operations on the other side. Or—let both stations do identical operations simultaneously or in sequence. Or—each station works as an independent machine. Different cycles are obtained through switches, and adjustment of dogs and orifices.

For complete information, call your local Ex-Cell-O representative, or write Ex-Cell-O in Detroit for Bulletin.



Tooling and chucking equipment of the left station. Slides are wide enough to accommodate tools on both sides of the centerline of a part.

EX-CELL-O CORPORATION
Detroit 32, Michigan

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS
AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

56-2

Washington . . .

Military budget boost . . .

The Administration has tagged a $547.1-million supplemental appropriation request to the fiscal 1957 budget—bringing the total Defense Dep't request for new money to $36.1 billion. Almost half the added funds will be used to step up B-52 bomber production; $50 million will be earmarked for an interservice fund to handle costs of "unforeseen developments" in ballistic missiles.

The extra funds are expected to add about 30 planes to the Air Force's B-52 procurement program, which now reportedly totals about 300 aircraft. Almost $20 million will be needed to expand Boeing production facilities—mainly for machine tools—to handle the increased output.

The move comes in the midst of a special Senate investigation of military airpower policy. Some observers view the call for more money as a step to take some of the sting out of Congressional Democratic criticism about the rate of long-range bomber production.

About $400 million of the added funds will be spent in fiscal 1957. This hikes the defense spending estimate for next year up to $35.9 billion—$1.4 billion more than will be spent this year. President Eisenhower said the added expenditures will not "unbalance the 1957 budget." The administration looks for a $400 million federal surplus and increased tax revenues next year.

Also included in the supplemental appropriation request are funds to speed up construction of the arctic radar warning network and for additional Navy guided-missile ship conversions.

New rules on arms information . . .

The pentagon has tried to clarify its controversial policy on the release of contract information by military producers. But as is frequently the case when Washington wants to "clarify" a fuzzy policy, the confusion has been compounded. The press generally reported the policy change as a "new crackdown" on defense news. But Defense Department officials claim it is a "liberalization" of previous restrictions. Actually, the new policy falls somewhere between.

It sets up for the first time uniform and specific guidelines on what can be disclosed about new aircraft and guided missiles. For planes, it bans the release of information about general performance and physical characteristics until the factory rollout of first production models, allows disclosure of manufacturer's name and model designation only after mockup. On engines, model designation and manufacturer can be revealed only after the engine's 50-hour qualification test. On guided missiles, no information—manufacturer, model designation, and the like—will be released until after the delivery of first production models.

In the past, there was only a general White House ban on releasing all new weapon data until a full year of production. But there was no uniform enforcement of the policy. Some security officers enforced it strictly, others winked at it.

Some observers feel the new policy is more restrictive than ever; that by setting down in black and white specific "guidelines," the Pentagon has imposed harder and faster restrictions. Their point is there was enough leeway under the general news curb previously in effect to allow the release of a certain amount of information on new weapons. For instance, in a recent speech, Air Force Secretary Quarles revealed for the first time official names and contractors for two new ballistic-missile research projects. Theoretically, the new policy prohibits disclosure of such data until first production models of the missiles have been shipped to the Air Force. But the new policy presumably will allow for exceptions to the rule.

Other observers say the new policy is at least a faltering step in the right direction; that it is an attempt to modify what was clearly an unworkable scheme. The new policy was announced soon after testimony by several prominent scientists before a House subcommittee, charging that Washington's security policy has stifled scientific research; that excessive secrecy beyond military necessity has blocked dissemination of important research data.

Top military contractors . . .

The Defense Department's latest list of top military contractors shows up the changing character of the U S munitions industry. The shift is away from wide-scale arms production in a broad range of industries and firms; munitions makers are becoming almost a definite segment of industry centered around aircraft and electronics firms. In the past six months, top contractors were North American Aviation, General Dynamics, Boeing, United Aircraft, and Curtiss-Wright. On a cumulative basis since Korea, top contractors are GM, Boeing, United Aircraft, GE, and Douglas Aircraft.

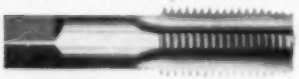
Progress on atomic plane . . .

Air Force has awarded contracts to Lockheed and Convair for "further development" of an airframe for an atomic-powered plane. Both firms have been working for years on initial design projects. Observers say the firms are now getting ready to put their blueprints into hardware. Up to now, the most progress has been in powerplant design — a GE prototype is now being tested. Experts expect the first flight test of a complete A-plane by 1958.

Phone your local INDUSTRIAL SUPPLY DISTRIBUTOR

BAY STATE TAPS

Little Jack Horner sat in a corner
Checking his taps and dies.
He checked for precision, long-life, and condition,
And said, "Bay State takes the prize!"



BAY STATE TAP & DIE COMPANY
MANSFIELD, MASSACHUSETTS

Detroit . . .

Two parts makers succumb . . .

The automotive parts business appears to be a rough and tough affair.

Witness the number of big strong companies that have chosen to get out of it, most of them after long years of competition.

Briggs was at one time a name to conjure with in the automotive parts field. It voluntarily withdrew. So did Murray Corp and Universal Products.

Now along comes Motor Products to announce that it is "getting out of the auto parts business."

The announcement ended a long period of guessing. Rumors have had it that Motor Products' bids for '57 business were too high and would be rejected.

Motor Products has been making about half of all window moldings and ventilators on cars other than General Motors, plus interior and exterior trim. Ford and Chrysler have been principal customers.

Ford is reportedly shopping hard for a supplier to replace Motor Products. Word is out that Chrysler may begin making its own parts.

Explaining why it has chosen to get out of the auto parts business, Motor Products bluntly says, "A reasonable profit could not be made." The company has done a $40 million annual business the past two car model years. Total sales for the fiscal year ended June 30, 1955, were $83 million. Only activities outside of auto parts are in defense products.

Second auto parts manufacturer to retire from the field the same week, Vinco Corp of Detroit, maker of bumper guards for Mercury, all AMC models, all Studebaker-Packard cars, and some Chrysler lines, will continue to fill orders for '56 models until June, than will liquidate its industrial stamping operations. This means a 149,000-sq-ft plant and a 31,000-sq-ft plant will be sold.

Automobile companies through the years have pressured parts makers for low prices. The threat that they will make the parts themselves has been used traditionally to whip the parts people into line.

Turbine materials hint . . .

Chrysler engineers revealed this about the turbine-powered Plymouth making the cross-country run: Blades are cobalt, nickel, chromium alloy. But the proportions of cobalt and nickel are small enough that full auto production of turbines would take only a small part of present output of those scarce metals.

Blades are cast, and probably precision investment castings, at that. Finishing is by hand, probably with contoured abrasive belts—admittedly expensive.

They're not talking about regenerator materials—"that would be telling a lot." Same goes for regenerator operating temperatures.

New alloy revealed . . .

U of Michigan process reduces nickel alloy in vacuum furnace, providing better heat resistance. Metal has 38% more tensile strength than the cobalt alloy now used in gas turbines for aircraft and experimental autos. It has 2 to 10 times the ductility of earlier nickel alloys, and is said to be cheaper.

Dr R A Flinn says vacuum melting keeps out oxygen and other gases to improve heat resistance. Alloy is otherwise similar to metals tested earlier by the auto industry. Chrysler people point out that the furnace works fine, though no production runs are being made with it. Question is whether it has enough advantage to warrant its use.

Heard around Detroit . . .

Chrysler estimates none of present tooling could be used when production changes over to turbine power. There are no similar components.

Dealer stocks have been pared down to about a 40-day supply, compared with a 44-day supply at the end of February. Selling for the first quarter was only 11% under last year's first quarter. GM hit the million-car mark (U S) early in April, and both Ford and GM increased production around that time.

Plymouth is doing factory undercoating now at the Detroit, Evansville, and Los Angeles plants. Line at Detroit cost $150,000 to install. So many customers were ordering undercoating, Plymouth decided to do it for itself. Dealers are offered a 62-lb package—undercoating plus an inch-thick fiberglas pad for under the hood.

Borg-Warner is expanding facilities to the tune of $25 million this year—double its '55 outlay. Included are an electronics plant and lab at Santa Ana, Calif (Byron Jackson Div), and a multi-million-dollar research center at Des Plaines, Ill.

Cadillac is leasing part of the Detroit Hudson plant to stamp parts for the '57 line. The 900,000-sq-ft plant was bought from American Motors by "Hudson Detroit Associates," a Cincinnati syndicate. Metal-forming equipment now being moved in should relieve bottleneck in Caddy fenders and deck lids.

Chrysler was stymied by two minor labor disputes, and missed hitting earlier production rate by only a few units for the first quarter. Packard production was at zero first week of April for "adjusting" at the Detroit Connor plant.

Ford and Plymouth are talking about showing new models in late September. Buick is on record for a November showing; Chevrolet has named November, too; scotching rumors of an earlier showing than ever this year.

Continental production is down to six cars per day, compared with 16 a day a while back.

5203-B

IT'S A HAMILTON

INDEED

There is no way under the sun to do small, precision tapping with "production" speed, satisfactory tap life and acceptable accuracy, other than to use a tool designed for the specific purpose.

THE *Hamilton* SUPER-SENSITIVE SMALL HOLE TAPPING MACHINE IS SUCH A TOOL!

WANT ALL THE FACTS

Write for Hamilton Bulletin No. 5203. Address The Hamilton Tool Company, 830 South Ninth Street, Hamilton, Ohio.

IT'S A Hamilton Tool

USE IT WITH CONFIDENCE

Machine Tools . . .

Diversification gets attention . . .

Diversification seems to be the order of the day in the machine tool building industry.

Pratt & Whitney Co Inc has purchased the Jaquith Carbide Die Corp, Lynn, Mass, which will be operated as a P & W division. The company produces a wide range of carbide dies. Jaquith's plant facilities will be enlarged at Lynn.

This is the second Pratt & Whitney acquisition in the past few months, the Sterling Die Co, Cleveland, having been bought on December 29.

U S Industries, which owns Clearing Machine Corp and Axelson Mfg Co, has taken over the A-1 Bit & Tool Co, Houston, Texas, which makes special tools and valves for oil well drilling and testing. The Houston concern will be run as a branch of Garrett Oil Tools Inc, another U S Industries subsidiary.

E W Bliss Co has acquired a controlling interest in Matteson Equipment Co Inc, Poland, Ohio, which hereafter will be a Bliss subsidiary.

Manufacturing facilities of Bliss will be used to build steel mill equipment designed by Matteson and made up to now by independent contractors.

Davis Boring Tool Division of Giddings & Lewis Machine Tool Co has bought inventory, fixtures and engineering data of the Kelly Reamer Co, Cleveland. Operations and all tool stocks will be centralized at the Davis plant in Fond du Lac, Wis.

Individual identity of Kelly tool lines will be maintained. Replacement requirements will be handled by Davis representatives and field tool engineers.

Trigger contracts for $265 million . . .

Contractors on schedule A of the machine tool trigger program (pool orders for M-Day) will shortly be receiving orders from Washington.

About $265 million of contracts will be awarded at first. These orders will have the backing of some $21 million of cash in the hands of the General Services Administration earmarked to back up the trigger program.

This sum will take care of builders who ask for the 30% advance payments from the government, when the program is activated. It also will be available to purchase from pool-order contractors any machines that they are unable to sell.

Turbine program still stuck . . .

Reports that the turbine and gear program is about to roll have proved to be premature. The program appears to be still stuck in the Office of Defense Mobilization. It has been off and on so many times that some doubting Thomases are writing it off.

Certain officials maintain that it is being kept low for political reasons and will be brought out at an appropriate time, but not this fiscal year (ending June 30).

Brown & Sharpe builds in England . . .

First group of Brown & Sharpe automatic screw machines to be built in England has been completed by Mollart Engineering Co Ltd, for the newly-formed Brown & Sharpe Ltd, British subsidiary of Brown & Sharpe Mfg Co. Production of these machines will continue at Mollart until the projected factory of Brown & Sharpe at Plymouth is ready to operate. The factory will be built in three phases.

When production begins at the new plant, Mollart will switch to pilot output of another size of B & S automatics. Eventually this machine will be put into the Brown & Sharpe factory, while Mollart proceeds with tooling and jigging of a further model.

To insure interchangeability between machines built in England and those made at Providence, certain gages, jigs and fixtures were sent to England from this country.

Sales students to meet at Purdue . . .

About 300 members of the sales staffs of machine tool builders and distributors will meet July 30 to August 3 at Purdue University for a sales conference similar to the sessions held in previous years but passed over in 1955 because of the proximity of the Machine Tool Show.

It will be the eleventh conference sponsored jointly by the National Machine Tool Builders' Association and the American Machine Tool Distributors' Association.

Snyder Tool & Engineering Co has completed a $600,000 plant expansion at its Detroit factory, which builds automated special machine tools. Some $1 million of machine tools assembled in the new addition were shipped the first month of operation.

London cuts investment tax allowance . . .

British government, in an attempt to curb inflation at home, has withdrawn the investment allowance obtainable on new equipment purchased by British firms.

Under the Finance Act 1954 a buyer could claim an allowance from Inland Revenue equal to the tax on 20% of the cost. This allowance then was taken into account in calculating depreciation.

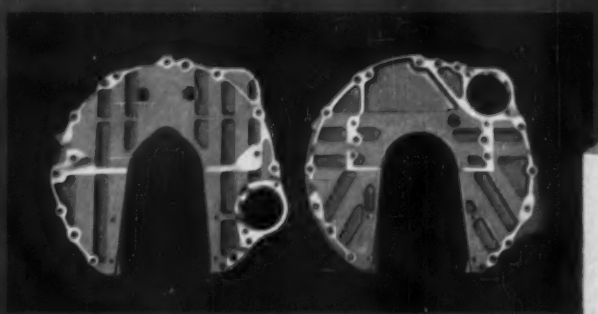
What the allowance amounted to was remission of tax equivalent to 8½% of the purchase price.

Buhr ECONOMATIC

performs 155 operations on two types of torque-converter adapter plates!

Production . . . 200 pieces per hour at 100% efficiency

Operations . . .
37 drilling, 12 reaming,
4 boring, 37 countersinking,
36 inspection
and 29 tapping



- Two types of plates may be loaded at random. Machine automatically selects and performs required operations
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- Automatic lubrication of all moving parts
- Mist-lubrication to all spindles to maintain uniform temperature in heads
- All spindles arranged for pre-setting of cutting tools to minimize downtime for tool changes
- Hardened-and-ground steel ways
- All standard and special parts interchangeable for ease of maintenance
- Machine conforms to J.I.C. Standards

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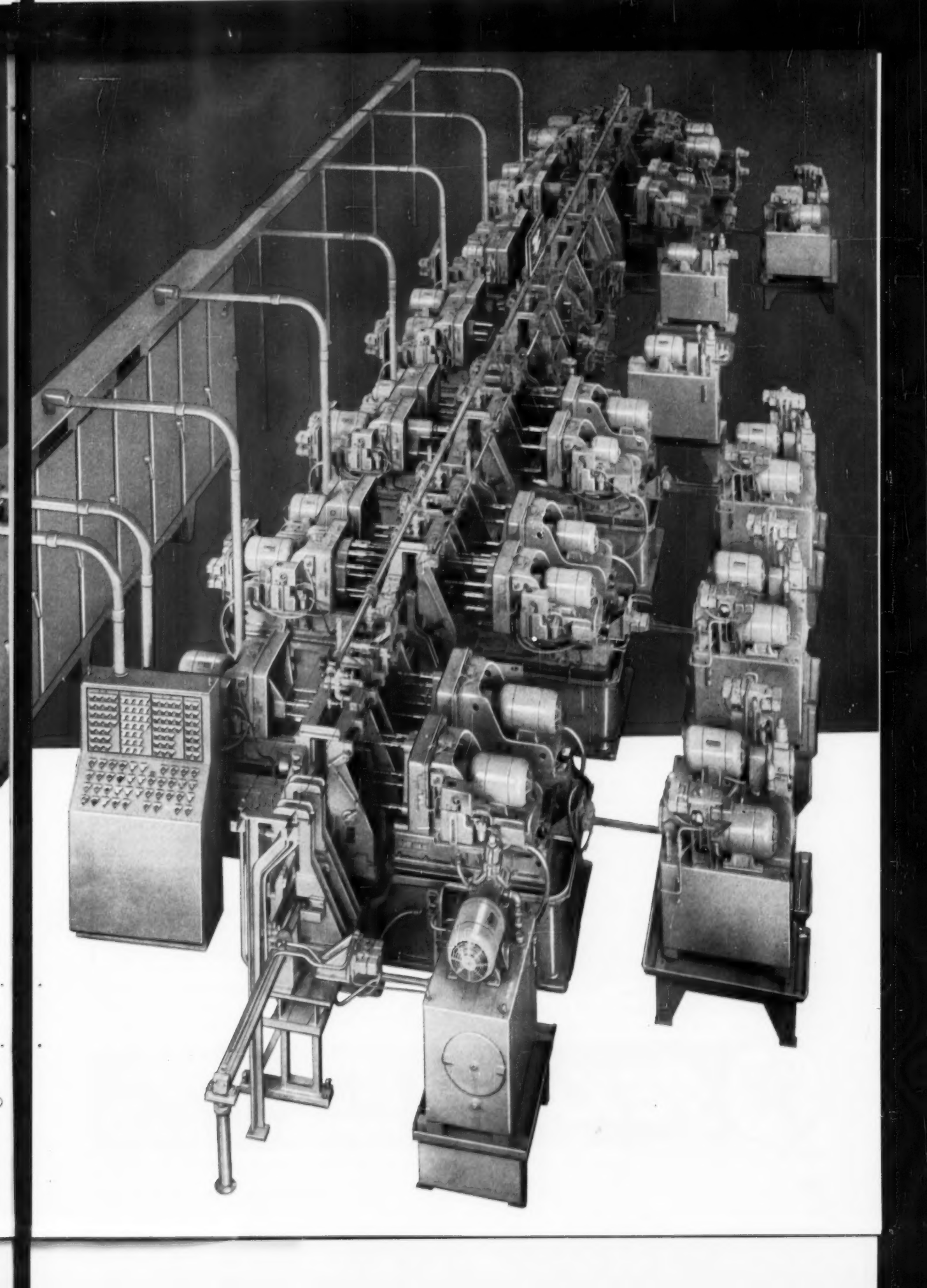
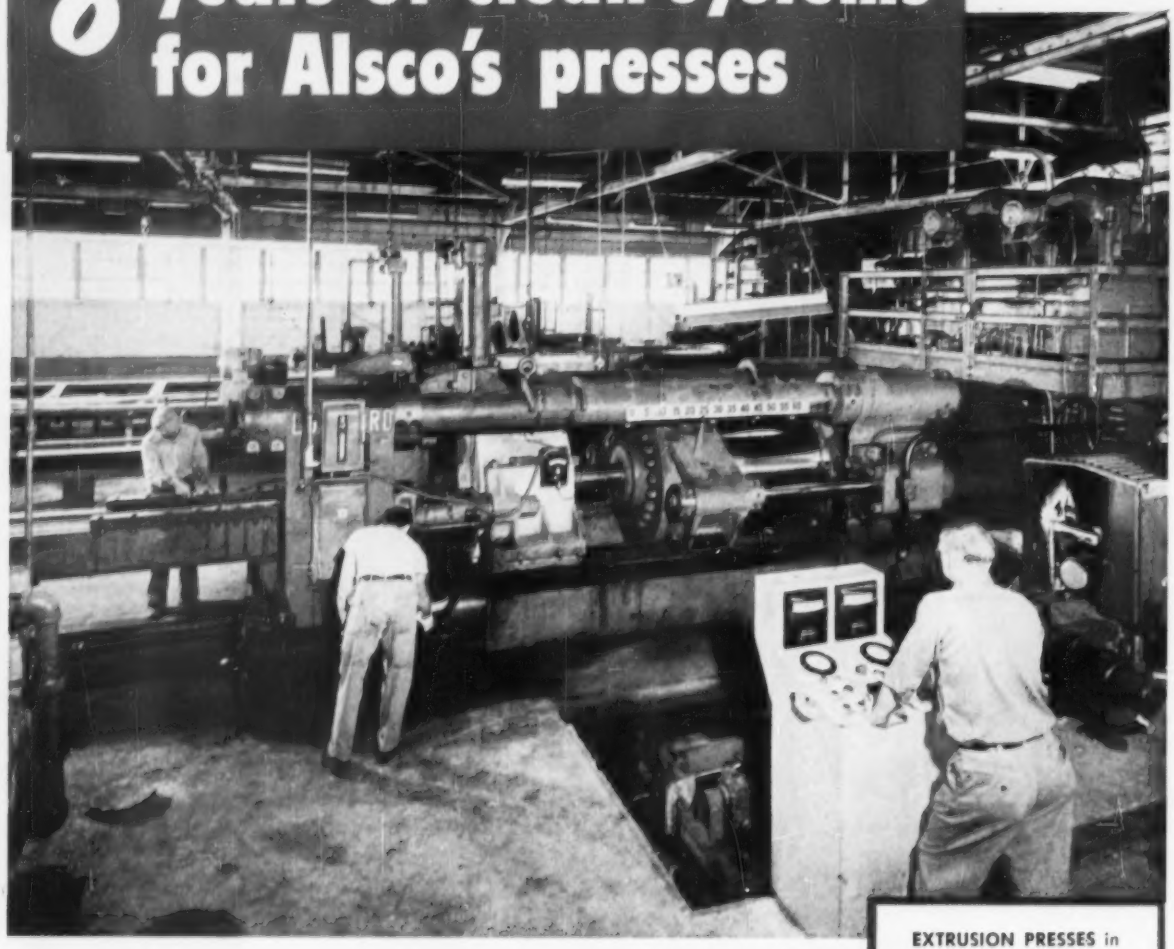


8 years of clean systems for Alsco's presses



EXTRUSION PRESSES in the Gnadenhutten plant of Alsco, Inc., Akron, Ohio. Pressures range from 1,100 to 2,000 tons. Operating temperatures are normally 140° F. — may go as high as 160°F. In addition, there are ten smaller pumps actuating the stretchers. All this equipment has used *Texaco Regal Oil R&O* for eight years with outstanding results.

ALSCO, INC., Akron, Ohio, has used *Texaco Regal Oil R&O* as its sole hydraulic fluid for the past eight years. During this period, the hydraulic systems in four heavy duty extrusion presses have remained completely free of rust, sludge and foam.

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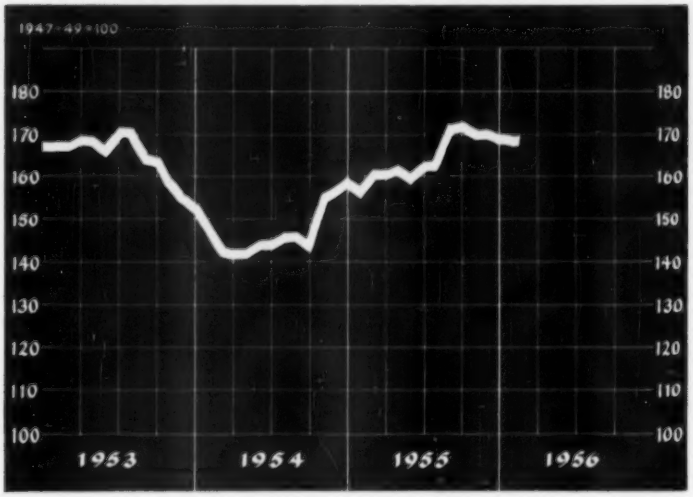
Gaging Metalworking . . .



169

AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	MAR Estimated	FEB Preliminary	JAN Revised	FEB Year Ago
Total index	**169**	**169**	**170**	**157**
Machinery	148	147	125	
Electrical Machinery	191	196	187	
Autos	138	152	152	
Other Transportation	314	298	273	
Other Metalworking	139	140	129	

Demand with a bang . . .

Evidence continues to pile up that the main drive behind Metalworking's current near-peak production stems from the capital goods industries.

Operations have whizzed along all year close to the peacetime high reached last September. And they seem destined to stay pegged awhile at about the present level.

Production equipment builders still are struggling to hike factory output up to match incoming orders. Meanwhile deliveries have lengthened.

Index of orders for industrial equipment and supplies placed by industrial distributors has risen again.

The present order rate is almost double that of the base month (July 1948) and has been exceeded only once since the Korean war, the American Supply and Machinery Manufacturers' Association reveals.

Tool and die shops packed with work . . .

Nowhere is the flurry of activity more apparent than in the contract tool and die industry.

Not only are Detroit shops packed with work (on 1957 model tooling programs, of course), but also shops all round the country, especially in the East.

Today's backlogs are about the same as those in October, 1953, when a peacetime record was set.

They have jumped 19% in a month and are 87% above a year ago. They stand at an uncomfortable 8-10 weeks, National Tool and Die Manufacturers Association says.

Turbine orders booked into 1958 . . .

Makers of heavy electrical goods are swamped with business. Turbine orders are scheduled to plant capacity through the early months of 1958, and some contracts are being made for 1959 delivery.

Farm equipment industry is one of the few depressed segments in Metalworking. Important manufacturers are planning drastic cuts in farm tractor output by May 1. The seasonal drop is coming 30-45 days ahead of normal. Farmers are inclined to "sit on their hands" until they see better days ahead.

No letdown is expected in steel operations, which should stay at capacity through the second and probably the third quarters.

Steel users undoubtedly are laying away some tonnage against a possible strike (not a good bet) and higher prices (a sure bet). But no one knows for sure how much inventory building is going on

Record year for gray iron castings . . .

Gray iron people expect 1956 to be the biggest year ever. Castings output should surpass the 1951 peak of almost 15 million tons.

Machinery, construction and utilities comprise the major markets for gray iron castings. All of them have been registering slow but steady increases for more than a year.

Big crisis swirls around the supply of scrap. Main complaint is that government is permitting scrap to be exported at an alarming rate. And no limitation is put on grade and quality.

Trend is toward fewer foundries. About 300 have gone out of business since 1953 because they did not pay enough attention to costs.

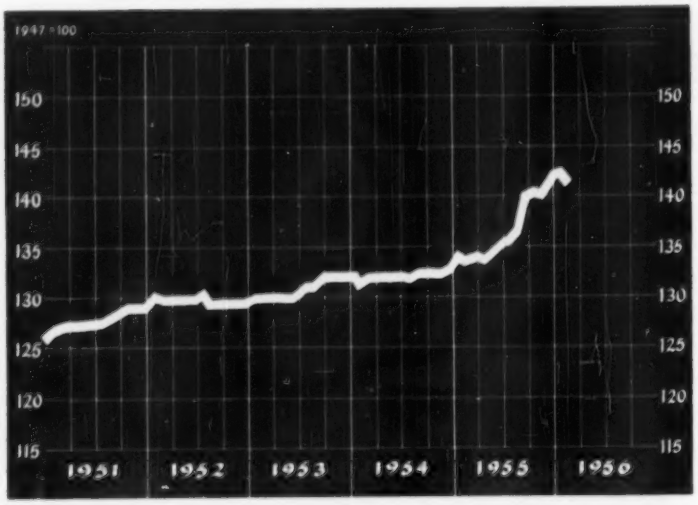
Gray iron foundry business from Detroit is about the same this year as last.

Gaging Business . . .

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	MAR Estimated	FEB Preliminary	JAN Revised	FEB Year Ago
Total Index	**141.8**	**141.6**	**141.5**	**134.2**
Metalworking Machinery	161.4	160.9	145.9	
Other Machinery exc. Electrical	148.3	148.1	138.8	
Electrical Machinery	138.1	137.8	131.9	
Fabricated Metal Products	136.0	136.0	130.6	

141.8



Inventories at all-time high . . .

Stocks of goods are being built up pretty fast by everybody. Manufacturers have a lot of raw and semi-finished materials around. They also are pushing products out of factory doors faster than customers can take them.

Jobbers and retailers also have been accumulating goods. Sales are very active, but stocks are still piling up.

Here are some figures: Business inventories—goods held by manufacturers, wholesalers and retailers—totaled $83.5 billion at end of February. That is an all-time record.

Industrial production may ease a bit . . .

February build-up of stocks was at an annual rate of $8.5 billion, compared with a normal rate of about $3.5 billion.

Biggest increase was scored by manufacturers, whose inventories rose $500 million, after seasonal adjustment.

This development, however, should not be viewed with alarm. Neither can it be ignored.

It would not be surprising if industrial production, as a result, eased a bit the next few months. Not a lot, but just a little. It might drop off a point a month, not enough to excite anyone.

Prices of industrial goods rise . . .

Industrial prices continue to head upward. Meanwhile the cost of living holds steady.

Prices of industrial products are at about 121% of the 1947-1949 average. That is roughly 5% higher than a year ago. Prices have risen without pause for 11 straight months.

Cost of living is at 114.6%. It has moved up only slightly the past year.

Personal income hovers around the all-time high which was reached in December 1955 (at an annual rate of $314.3 billion).

Decline in automobile industry payrolls has been offset by gains in other industries.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949 = 100)*	148.5	148.4	139.3
Steel ingot operation (thousands of tons)	2,414	2,406	2,284
Electric power output (million Kilowatt hours)	10,846	10,992	9,633
Production of automobiles and trucks	171,349	160,027	207,089
Engineering construction awards (Eng. News-Record—millions)	$529.8	$276.5	$272.7

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1947-1949 = 100)*	143	143	133
Index of durable manufactures production (1947-1949 = 100)*	159	160	147
Durable goods manufacturers' sales, millions*	$13,634	$13,688	$11,850
Machinery manufacturers' sales, millions*	$ 3,738	$ 3,648	$ 3,075
Durable goods manufacturers' new orders, millions	$14,710	$15,605	$12,142
Machinery manufacturers' new orders, millions	$ 3,827	$ 4,118	$ 2,936

*Seasonally adjusted

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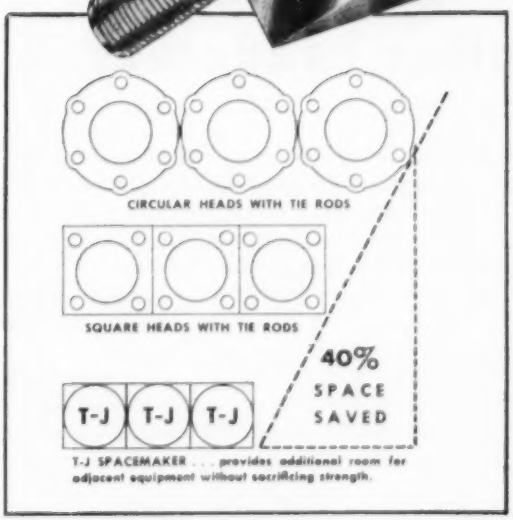

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Stainless steel discs hardened to Rockwell C40 to 41 looked like this after heat-treating.

How Armco 17-4 PH Stainless Steel cured these heat-treating headaches

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High temperatures required to harden grades formerly used caused severe distortion. This meant heat treat was saddled with costly, time-consuming straightening operations—plus the job of removing heavy scale.

Armco 17-4 PH eliminates these shop headaches. Distortion and scaling don't occur because this unusual high strength stainless steel can be fully hardened by heating at only 850 to 900 F for 1 hour and air cooling. With this low-temperature heat treatment, parts remain within tolerances and have only a light heat-tint discoloration.

These cost-cutting advantages also mean that you usually can finish-machine Armco 17-4 PH stainless parts before heat treatment. You don't have to reroute to the machine shop for finishing in the hardened condition.

If you are making hardened parts for corrosion resistant applications, Armco 17-4 PH Stainless Steel may help you cut costs and boost production.

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

Is Apprenticeship Obsolete?

How up-to-date are your apprentice-training methods? Are you putting youngsters through the same kind of training routine that you did ten or twenty years ago? Do you make intelligent use of them after they graduate?

These pertinent questions inevitably pop up after reading the report of the training committee of the National Machine Tool Builders' Association, made by Urwin Rowntree of the Brown & Sharpe Mfg Co. They apply equally well to all metalworking plants and not just to those of machine-tool builders.

A complete overhauling in thinking... about apprenticeship is about due. Perhaps the time has passed when every boy who enters the shop for training should be put through a standardized course that takes a predetermined amount of time, such as two years or four years. The idea no longer is blindly accepted that a youngster must "serve his time" in the shop—a specified number of weeks on lathes and on drilling machines.

The training program should be flexible to make it adaptable to the individual requirements of the learner. It should be tailor-made to fit his aptitudes and capacities.

Mr Rowntree even went so far as to suggest that the word "apprenticeship" should be put on the shelf. It is no longer appropriate because today young men are trained for a variety of jobs. They are not being "apprenticed" to a particular skilled shop job.

Streamlining of training programs... would be a healthy development, the committee reported. There is nothing sacred about the four-year term as the proper length of time for training. The general mechanics probably can be taught in a much shorter period, and perhaps better.

What is merely "nice to know" should be examined carefully to see whether it has any place at all in related classroom training. It is easy, and a temptation, to put into the curriculum attractive irrelevant material. Much better to stick to the essentials. If that is done, the time for training probably can be profitably shortened.

The committee commendably urged management to make use of the relatively new "applied imagination" techniques. So-called "brainstorming" is an obvious example. This kind of training leads to trainee participation and tends to develop latent talents.

Just because you have given a youngster the best possible training does not mean that he will stay with you willy-nilly. He has a certain responsibility to stay at least a while, of course. But you should make it interesting for him. The job should be a challenge. "How many new journeymen do you lose because of work assignments too simple and irksome?", Mr Rountree asked.

Choose the right trainee for the right job... if you expect your training program to click. The selection of youngsters is just as important as mapping out the proper training techniques to get the best results, the committee stressed.

What we are getting at is just this: Metalworking is likely to be plagued for a long time with a severe shortage of trained men. One way to assure yourself of the men you need is to train them.

Just because you now have a training program is not in itself a guarantee that you are licking the problem. Ideas about how to train men are changing fast. You should keep up with these ideas if you hope to have a training program that will meet today's and tomorrow's, rather than yesterday's, requirements.

Burnham Finney EDITOR

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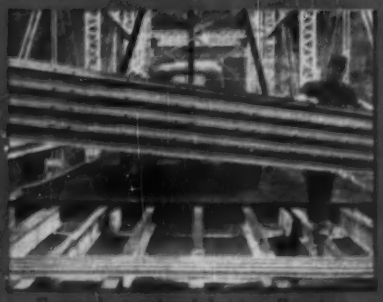
Photos courtesy of United Steel Fabricators, Inc., Wooster, Ohio



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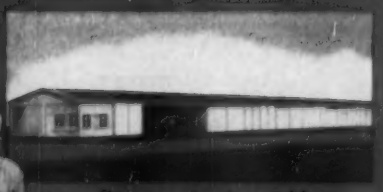


Permanent yet portable steel building

American Machinist

How to understand Spark Erosion

As told to WM M STOCKER, JR, associate editor
by R DECAT, president, ABACO INDUSTRIES
ELMHURST, NY

Each year, harder and tougher materials are developed—and each year science finds new ways to conquer them. Electronic erosion is one of the newer methods receiving world-wide attention. "Why," asks one man, "put the electrons through a motor to drive the cutting tool when you can use them directly to remove the metal?" It isn't that easy to discount motors yet, but the process has immediate advantages and tremendous possibilities. Here an expert describes the various techniques and tells what they can accomplish.

Remember the tap disintegrator? This tool was the earliest application of electronic erosion to Metalworking. It still solves a major problem, saves thousands of dollars annually, in removing broken taps from hardened and completed tools and dies. It also permits the drilling of holes remembered *after* hardening. By using a different principle and adding *control*, electronic-erosion equipment opens the way as a new metalworking process to the solution of many tough manufacturing problems.

To keep up with technological progress, even harder and tougher metal alloys have been developed, either by introducing harder components or by heat treatment. To machine these metals, still harder and tougher tools materials are developed. Now the problem is: How do you machine the tool materials easily, effectively, economically, and in all of the planes and forms necessary in drawing, stamping, and forging dies, and form tools?

Normally, the tool material must be harder than the material it is to cut. Diamond is the hardest tool material, and a few ceramics are next down the hardness scale; some distance down however. A number of the new alloys are almost as hard as the ceramic cutting material — and *it* is not always practical. Even the new ceramic cutting tools reduce the problem of very hard materials only slightly.

Diamond grinding has many shortcomings. Only flat surfaces are readily machined. Interior and irregularly shaped surfaces are extremely difficult to work. Industrial diamonds are expensive, and diamond grinding wheels, especially shaped wheels, are costly to produce. Diamond grinding requires skilled operators. One other disadvantage of grinding is that the heat generated may cause "checking", or minute cracks, in the hardened-work surface.

As there is no harder material to do the job, the answer to working these hard metals must be found in another process and a *softer* tool material. Actually, there are two other methods: ultrasonics and electronic erosion. This article will deal only with the latter. With electronic erosion there is *no cutting material*—only a powerful cutting *force*. The force is directed to the point of release by a conductor shaped to the desired contour of cut and resembling a cutting tool. A soft, easily worked, material such as brass is used for the conductor.

Electronic erosion will cut the hardest electrically conductive materials known without heat, alteration of physical properties, chemical changes, or decomposition in the area surrounding the cut. It permits precise machining of the most intricate shapes.

In principle, electronic erosion is not new. By making a spark jump, in free air, between a sharp point and a plate, Sir Joseph Priestley observed in 1768 that the plate contained a small crater sur-

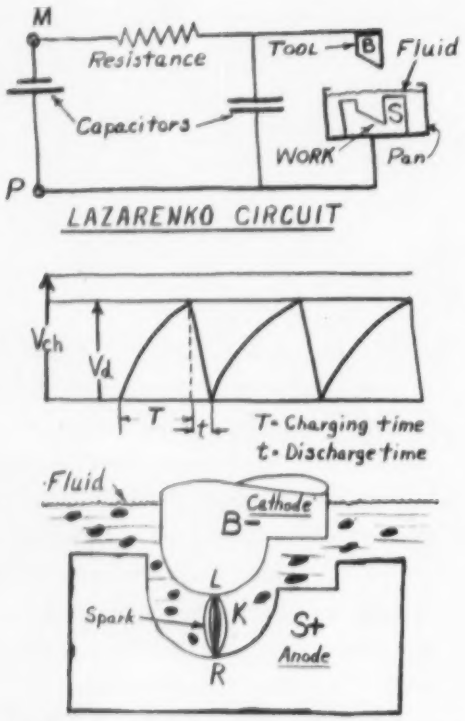


Fig. 1 LAZARENKO CIRCUIT provides the spark-generating source needed for electronic erosion; it was developed during a study of contact-point failure. Capacitor charges under voltage V_{ch} during time "T", then discharges within a few microseconds "t" when it reaches partial charge V_d. Full charge takes four times as long and increases spark strength only one-third. Enlarged sketch of tool and work shows action between electrodes

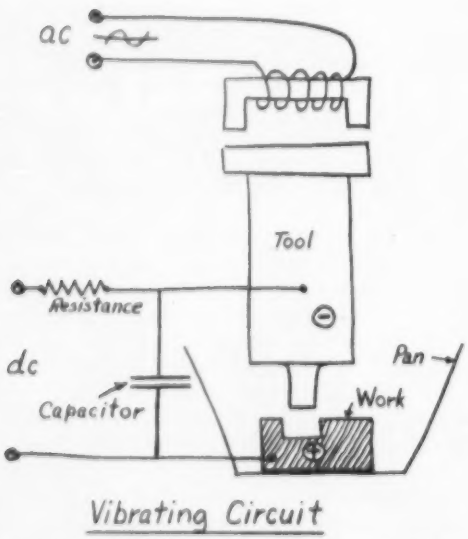


Fig. 2 SIMPLE VIBRATING CIRCUIT minimizes arcing. However, it reduces actual time electrode is cutting. More efficiency is achieved by providing constant electrode fed with device to retract electrode only when arc occurs, but instantaneously

rounded by darkly colored spots. He also reported a tiny drop of molten metal that resulted from the electrical discharge (arc) phenomenon. Soon afterward, scientists discovered that the dark spots resulted from the oxygen in the air, that they could be avoided by jumping the spark in neutral gas or any gas free of oxygen. Following this finding, Grove and an assistant established that anode wear is more important than cathode wear. Then they classified various metals according to their increasing resistance to spark erosion.

During the 19th Century, Bredig and Svedberg used electricity to prepare colloidal solutions of metals, first in water by using a direct-current arc and then in other liquids; finally by replacing the dc arc with a series of alternating-current sparks. This is the first recorded industrial use of short-duration sparks in close succession.

ARC VS SPARK

Note that there is a distinct difference between *arc* and *spark*. Both may be produced by ac or dc. However, the arc occurs in a conducting medium such as ionized gas or an electrolyte, while the spark occurs between two electrodes separated by a non-conductor, a vacuum or a dielectric fluid. An arc is struck by bringing the two electrodes together, then separating them. A spark occurs when the voltage, the "pressure", at one electrode overcomes the resistance of the dielectric separating it from the other electrode. The important thing to remember is that the arc erodes with heat, or burning, while the spark erodes without noticeable heat.

In 1919, Kohlschutter developed the most effective circuit for spark generation. Then, in Russia, about 1938, while seeking the best alloy for high-duty contacts, the team of P P Lazarenko and N I Lazarenko used the same circuit. To get rid of unwanted extra current formed by the breaking of the arc during their experiment, they connected capacitors in parallel. They experimented with contacts immersed in a variety of liquids and immediately noticed that the anode was wearing out 10 times as rapidly as the cathode. Also, whatever the shape of the anode, it corresponded to the cathode.

From these results the Lazarenkos recognized industrial possibilities in the technique and started development of an electronic-erosion machine. (In 1946, Russia purchased a tap disintegrator from Elox and, in 1947, **American Machinist** published an article from Russia on electronic-erosion machinings. Here, Industry showed little interest in the new concept.)

Parallel with the Russian interest, companies in the U S such as Elox and Clinton worked in the same area of interest to develop the tap disintegrator. However, these machines were fairly crude and depended upon an arc rather than a spark to remove broken taps and drills. The technique consisted of an electrode working with water as a coolant to disintegrate the center of a broken tap or drill. Diemakers found that the equipment would also put holes in hardened steel dies. Recognition

of the machine-tool possibilities developed rather slowly.

Electronic erosion starts with the generation of a spark and most of the machines available today follow the Lazarenko principle (Fig. 1) to provide the spark. The aim is to reproduce in a hard material the exact shape of a soft material, in this case the cathode "B" or "forming tool."

Erosion occurs through the action of the spark jumping from one electrode to the other. These electrodes are, when both electrodes are fixed, immersed in oil. Or, where one electrode is rotated or vibrated, air serves as the dielectric.

Basic circuitry is simple. A capacitor "C" is charged by direct current in "P" and "M" through a resistor "R". The forming electrode and the work are connected in parallel to the condenser "C". The capacitator charges itself in a time "T", under tension "D", and discharges very rapidly (in a few micro-seconds) between "B" and "S". Discharge time is from 0.1 to 0.001 of the charging time hence, because power is the quotient of energy times time, the power at release is 10 to 1000 times the original input. If the power source is 1 kw, each spark will hit the work with between 10 and 1000 kw per 0.000015 sq in. or an equivalent of more than 50-million kw psi.

"SPARK-BLASTING"

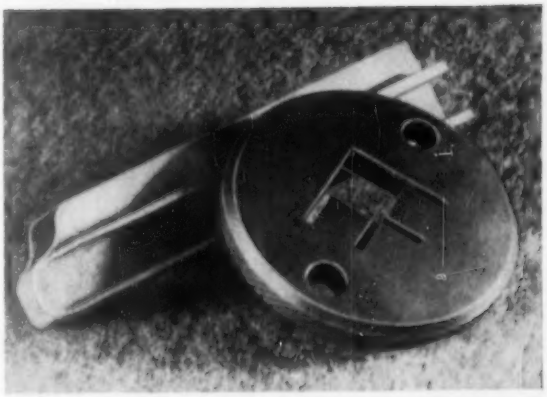
More than anything else, this sudden release of extremely high energy explains the phenomenon of electronic erosion. The work is immersed in a dielectric liquid such as mineral oil, kerosene, light fuel oil, or even dielectric water. The tool electrode never touches the work as the spark actually removes the metal. The electrodes (tool and work) are separated by a few thousandths of an inch for fine finishes and are further apart for roughing. In all cases the shape of the tool "B" is reproduced in the work "S". Circulation of oil is constantly maintained between the electrodes. This fluid serves both as a dielectric and to flush away the minute particles of metal as they are eroded away.

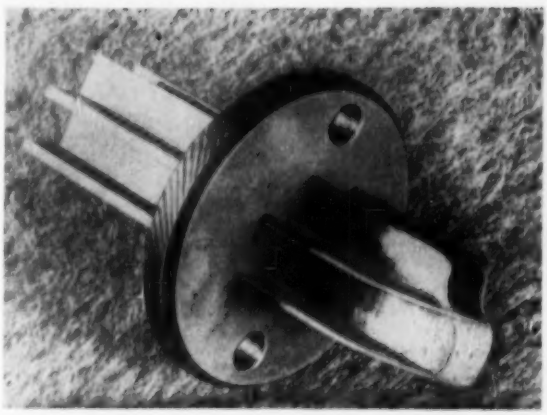
Because the electrodes are very close, and the distance is critical, it is difficult to maintain the gap by hand control. Hence, a small, sensitive, servomotor is used to control feed. Voltage across the gap is used as a reference to cause the servo to retract or advance the tool-electrode, thus maintain the spacing as the work is eroded.

When the capacitor reaches the necessary intensity, the spark discharges through an ionization channel formed in the dielectric fluid. Then the channel closes and the capacitor recharges to renew the cycle.

One other value of this circuit is that high-intensity spark is developed at a relatively low voltage —from 1 to 400 v. Thus, the tool must be placed near the work and this permits the high precision and fine finishes.

Many hypotheses have been offered to explain why metal is removed. Most of them differ only in detail. Tremendous research is needed to narrow those differences. Here is the consensus of opinion that *appears* most logical:

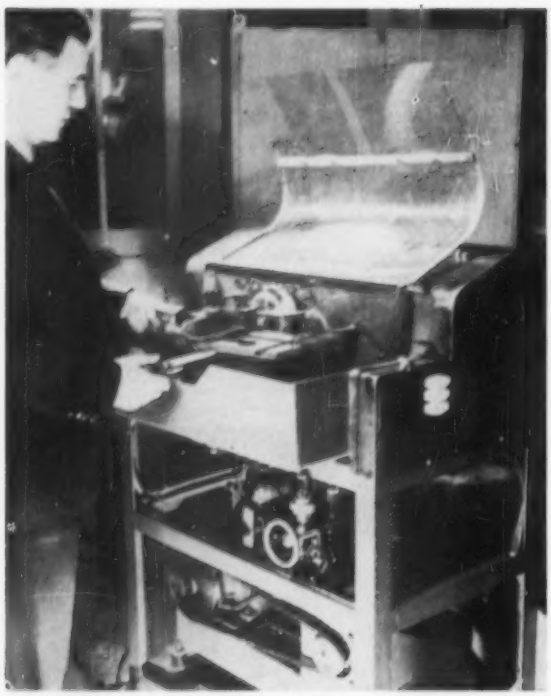


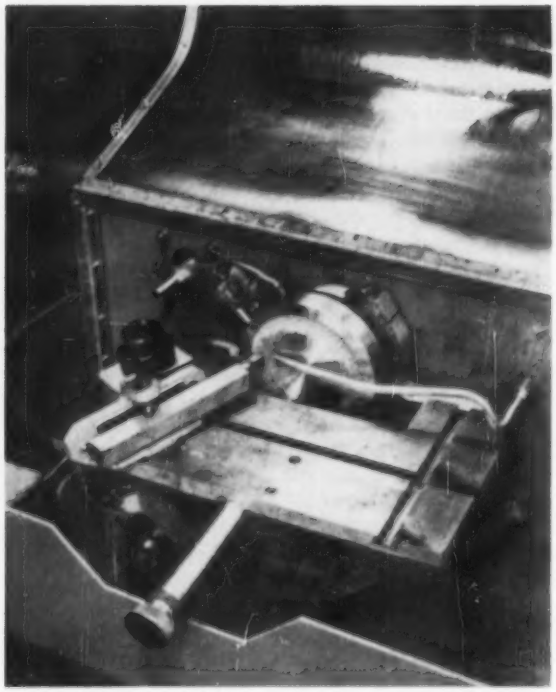


EXTRUSION DIE of heat-treated high-chrome-nickel alloy and the preformed brass electrode (tool) used to produce it. Note that electrode is tapered to permit the roughing operation to precede finishing all in one setup, also erosion on the end of the electrode. With tolerances of ±0.0005 in., machining was completed in 45 min. Roughing required only 10 min. No pre-drilling was done on this piece which is 0.400 in. thick and has a hardness of R_c 64

As described, the space between the electrodes is very small and is filled with a dielectric fluid. Because the rupture of the dielectric film occurs between the two points separated by the shortest distance, an extremely high-intensity current is developed at the relatively small impact surface. As the electrical conductivity of the material is not infinite, an extremely powerful electro-magnetic field is created which puts the molecules of the anode (work) in tension.

When the electrical forces exceed the resistance to rupture of the work material, molecular particles are torn from the work and are pulled to the cathode (tool). Simultaneously, the cathode is under compression which could be one reason why it is not so rapidly eroded. Still positively charged, the metal molecule starts on its way to the cathode (unlike charges attract) but, even though the distance is only 0.001 in., it is like a 1-in.-dia steel ball travel-





CARBIDE-TOOL SHARPENER erodes carbide without use of diamond; is typical of more recent developments using rotating-disk electrodes. Brass or cast-iron wheel replaces diamond-impregnated wheel. Machine (left) has safety cover removed to show motor, generator, and details such as capacitors, rectifiers, and the speed-control wheel. A stream of oil serves as dielectric and to help remove the grit. Current is carried into the brass wheel (electrode) by brush and commutator assembly behind it (right)

ing one mile for this molecular particle. It is simply swept out of the channel by the strong flow of dielectric fluid. Later it is trapped in a special filter. The few particles that do reach the cathode cause its erosion.

All of the studies of either particles or eroded surfaces seem to confirm the theory that the metal is torn out by purely mechanical effect coupled with intense heat at the point of impact. Impact occurs in a few micro-seconds, a period so short that the influence of generated heat is negligible in its metal-removal value but craters are seen under a powerful microscope. Surfaces machined by sparks indicate only mechanical rupture and none show any influence of temperature.

Furthermore, photomicrographs show that the work surface is not affected below a depth of 0.0001 in. Physical properties of the machined metal are not modified in any way.

Under the auspices of the French Government, Messrs Marc Bruma and Michael Magat systematically studied the variables in the Lazarenko circuit to establish the reasons limiting its use on an industrial scale. They defined the quality of process in terms of speed of metal removal (number of ounces of metal removed per unit time, usually minutes) and the finish on the pieces.

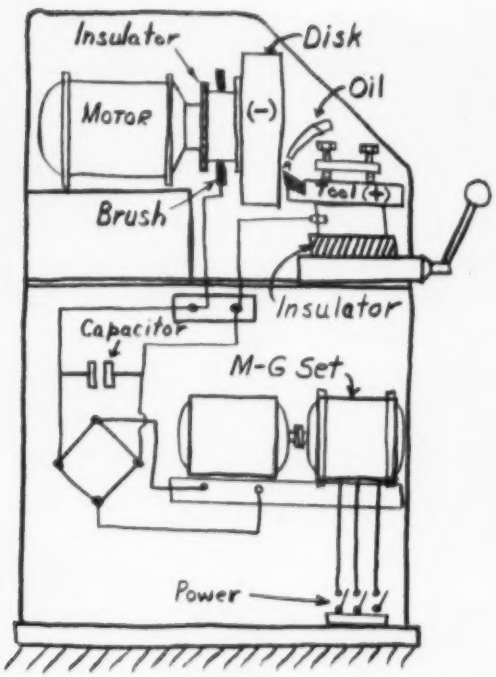
In the basic Lazarenko circuit, two types of current result during discharge. One current is generated by the energy stored in the capacitors, representing the active part of the circuit, and the other current comes from the power source. As the latter creates unnecessary arcing which might harm the work finish, it is undesirable.

Where fine surface quality is desired, machines are designed to prevent arcing. For operations such as roughing, sawing, or cutting, arcing is most useful and the dielectric fluid is replaced by an electrolyte to increase it.

None of these variables can be studied separately as the spark frequency is a mutual function of the capacity "C" and the resistance, "R". Note in Fig. 1 that at the beginning of its charging time the capacitor absorbs a very high intensity, limited only by the resistance. The voltage "V" at the capacitor outlet increases and the intensity of the charging current decreases while the capacitor voltage approaches exponentially the primary feeding voltage.

After a lapse of time, $T = RC$. The voltage "V" at the capacitor discharge is 0.63 or 63% of the input voltage. Still later, $T = 4\ RC$ and $V = 0.92$. Thus, waiting four times as long to charge the capacitor increases the voltage only one-third. The distance between the tool and work electrodes can be adjusted to cause the capacitor to discharge before it reaches a full charge—after a time "T" equals KRC. Then the discharge frequency "f" equals 1/KRC.

For the optimum highest-power condition, from experiments, $K = 1.3$ (approx). Then $T = 1.3\ RC$ and $V = 0.73$. For the same value of R, the fre-



GRINDING MACHINE SETUP

quency and the capacity vary inversely. Hence when $K = 1.3$, $P = 0.21\frac{V_s}{R}$ (in watts). It appears that the aim is to have maximum energy for maximum machining speed, therefore to increase the input voltage and decrease the resistance.

However, for mechanical, electrical, economical, and safety reasons it is impractical to use too high an input voltage. Also, there is no advantage to using too powerful a spark because, while it provides rapid cutting, it produces poor finishes. Reducing resistance, again, increases cutting speed but introduces the danger of arcing (unless finish is secondary to cutting rate). Increasing capacitance permits a reduction in resistance but this increases the time constant and, simultaneously, reduces spark frequency, thus slows cutting time (and improves finish). It is apparent that precise, well-balanced, control is essential.

Most of today's machines operate on a 220-volt input. From an ac system, this voltage is passed through a rectifier and into the working circuit. The actual current used on an industrial machine seldom exceeds 15 amp. Precise controls permit regulation of machining speed and surface finish. There seems to exist a low limit for charging time "T", in the neighborhood of 100 microseconds, which produces a frequency of 10,000 Hertz. However, one Swiss manufacturer, after a thorough study of capacitor discharge, produced a frequency in the 100-kilocycle range.

Examples of metal-removal rate, in the laboratory, using a brass electrode on a high-resistance alloy:

Capacity (microfarad)	*Metal removed (gram/min.)*
30	0.05
100	0.39
300	0.56
500	0.94

Electrode material greatly influences metal-removal rate and surface finish. Typical effects with different materials when working tungsten carbide include:

Copper	–0.060 gram/min.
Silver	–0.047
Copper-zinc alloy 50-50	–0.040
Nickel	–0.037
Copper-silver alloy 20-80	–0.024
Aluminum	–0.014

However, it is said that metal-removal rate increases in proportion to the logarithms of the electrode's surface area. Also, the tool electrode behaves differently depending upon the nature of the material it is cutting.

The influence of dielectric fluid on metal removal is very noticeable. While kerosene and transformer oil appear to be most widely used, other fluids have been rated:

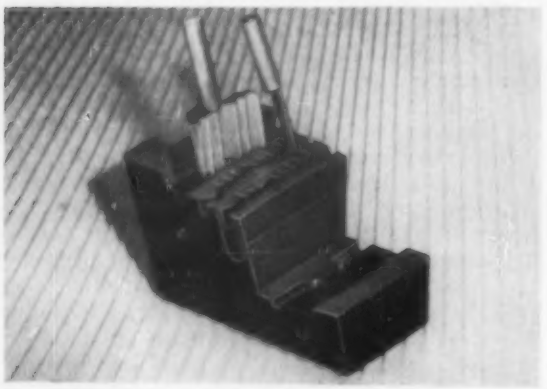
Petroleum jelly—0.15 gram/min. at C = 400 mf
Petroleum—speed increases linearly with C; 0.12 gram/min. for C = 800 mf
50-50 mixture of first two—maximum of 0.09 gram/min. for C = 400 mf
Glycerine and water—increase is linear 0.02 and 0.04 gram/min. respectively for C = 800 mf
Carbon tetrachloride—gives a curve which, for C = 500 mf, becomes an asymptote with max. equalling 0.06 gram/min.

While Fig. 1 describes the principle of spark erosion, this arrangement, alone, will not permit continuous operation. Frequent short circuits will occur between the tool and the work as a result of the tool coming too close to the work, poor stabilization of the discharge current, formation of a conducting bridge of particles between tool and work, and other operating problems. Shorting stops the cutting action and creates arcs or local welds which destroy surface finish.

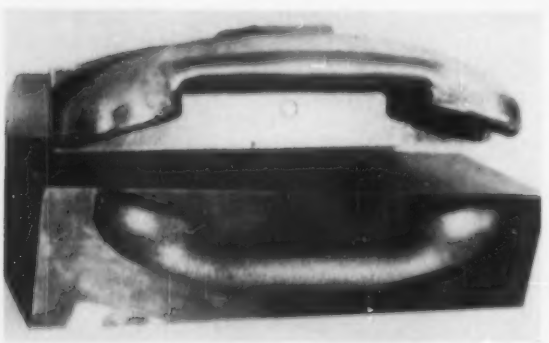
Short circuiting is prevented in a number of ways. Commonly it consists of pulling the tool away from the work by mechanically vibrating, or oscillating, the tool, or by providing a mechanism to retract the tool automatically only when a short circuit occurs. The latter follows the circuit-breaker principle.

In one design, the tool is oscillated up and down and the spark discharge occurs each time the tool comes close enough to the work to overcome the dielectric's resistance. This system is very simple but the discharge frequency is limited by the me-

MACHINING SLOTS AND PROFILES in special refractory metal for mounting a fixed turbine-reactor vane. Piece is eroded to depth of 0.100 in. in 3 min. Specifications would not permit any modification of chemical or physical properties of metal by machining process used. Slots and 10-in.-long comma-shape seat were held within ±0.002 in. Brass electrode is at the left



TIRE DIE SEGMENT is machined after hardening with two specially shaped brass tools. One electrode produces the zig-zag slot, then the thin, flat, electrode creates the slots at the bottom of the V-forms



COMPRESSION DIE for telephone handset (plastic) is produced by eroding from a brass electrode shaped to the desired form. Die is used "as-is" after sinking without any further polishing or finishing

chanical vibration frequency of the tool, at present about 300 to 400 cycles per sec. For efficient metal removal, this system requires a very powerful spark which, in turn, creates a poor surface finish. For this reason, most recently developed machines use electrically generated cycles.

Three different techniques are followed in equipment on the market today, although other methods may develop, to achieve efficient cutting:

Elox—100% through electronic tubes
Method X—Spark gap, either air or water cooled or rotating in the 15-kva machine.
Abaco—High-cycle, motor-driven, generator

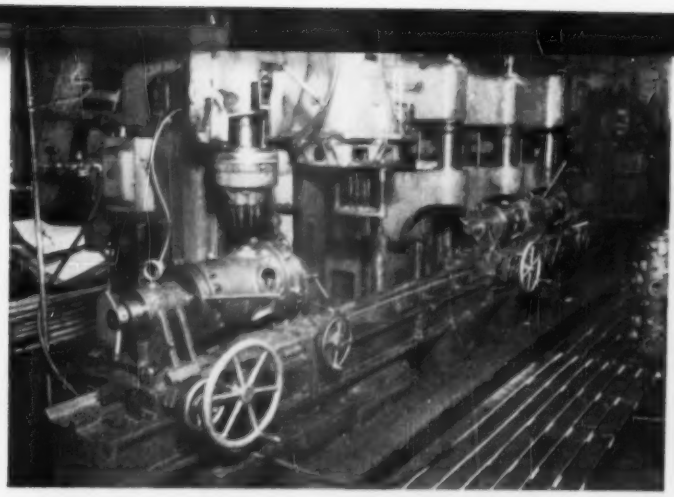
To satisfy the requirements of effective operation, the present machines include these elements:

- A source of intermittent high-frequency discharge to create and maintain high-intensity current throughout the machining operation.
- A battery of capacitors fed from this source.
- A standard control panel, including all control apparatus plus an electronic amplifier to operate the servo for automatic tool advance.
- A frame support for the table and pan in which the work is clamped, plus a toolholder.
- A servomechanism and automatic two-way servomotor to constantly control the distance between the tool and work as well as to feed down as rapidly as the work is eroded, and to retract the tool at the instant a short develops.
- An oil-circulating system with very thorough filtration of the dielectric fluid.

All of this equipment can be grouped in one or two units. Frequently, the electronic equipment is placed in a separate unit with two leads going to the electrodes on the machine and two leads going to the servo-motors. Because no effort is exerted between the work and the tool, the frame can be much lighter than for other machine tools. However, it must be rigid to maintain accurate reproduction, plus vibrationless stability of the work-holding table and the electrode-holding quill. Oil must be carefully filtered as the quantity of particles in the fluid directly affects machining time. Whenever possible it is fed, at high pressure, through a hole in the center of the working electrode.

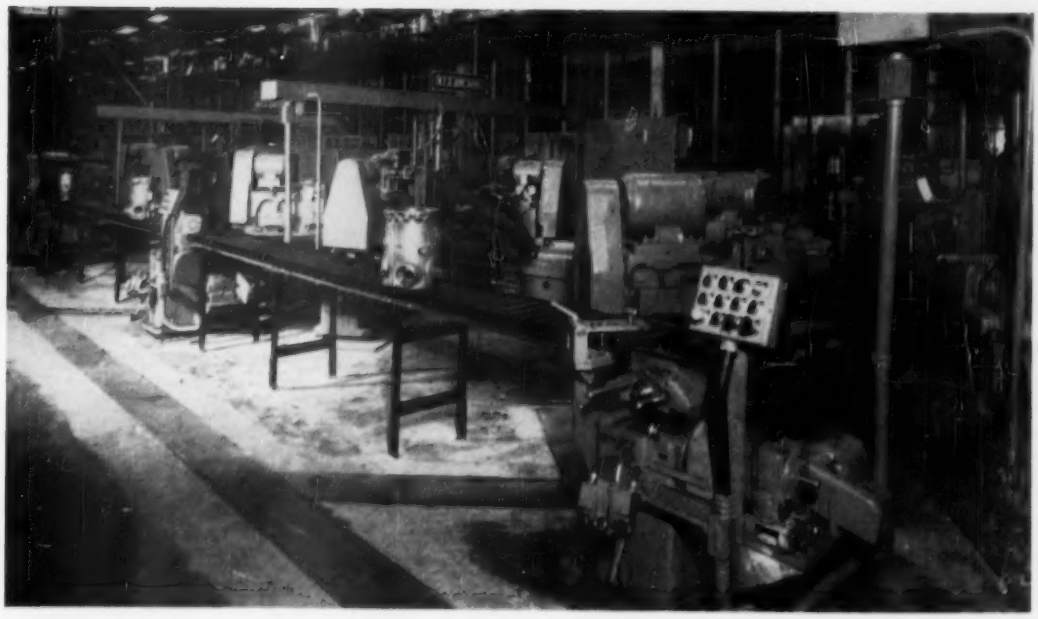
High metal-removal rates require higher tension, higher capacity, or a more powerful spark and automatically produce small craters at the point of impact, thus spoiling surface finish. The time required for fine finish appears very long, and it is. However, remember that the machine is entirely automatic; will operate for hours without operator attention. With a 4.5-kva machine it is possible to remove one cu in. of high-resistance, hardened, alloy in 15 min.

Further study of high-power electrical impulses, servomechanisms, metal cutting techniques, microidal suspension filtration, and the chemical nature of the dielectric in combination with the spark discharge may both increase the speed of cutting and broaden the applications.



BEFORE modernization, 14 operators and 21 separate machines produced 20 compressor crankcases per 8-hr shift. Later a total of 24 operators on two shifts were used to raise production to 80 cases per day . . .

. . . **AFTER** installing new tools and new machines, crankcase production went to 115 per shift with seven operators. New line includes ten special-purpose Barnes machines and seven standard machines as well as new tooling that eliminates excessive breakage, cuts tool-change time and increases life between grinds



On compressor parts . . .

Flexibility and economy dictate methods

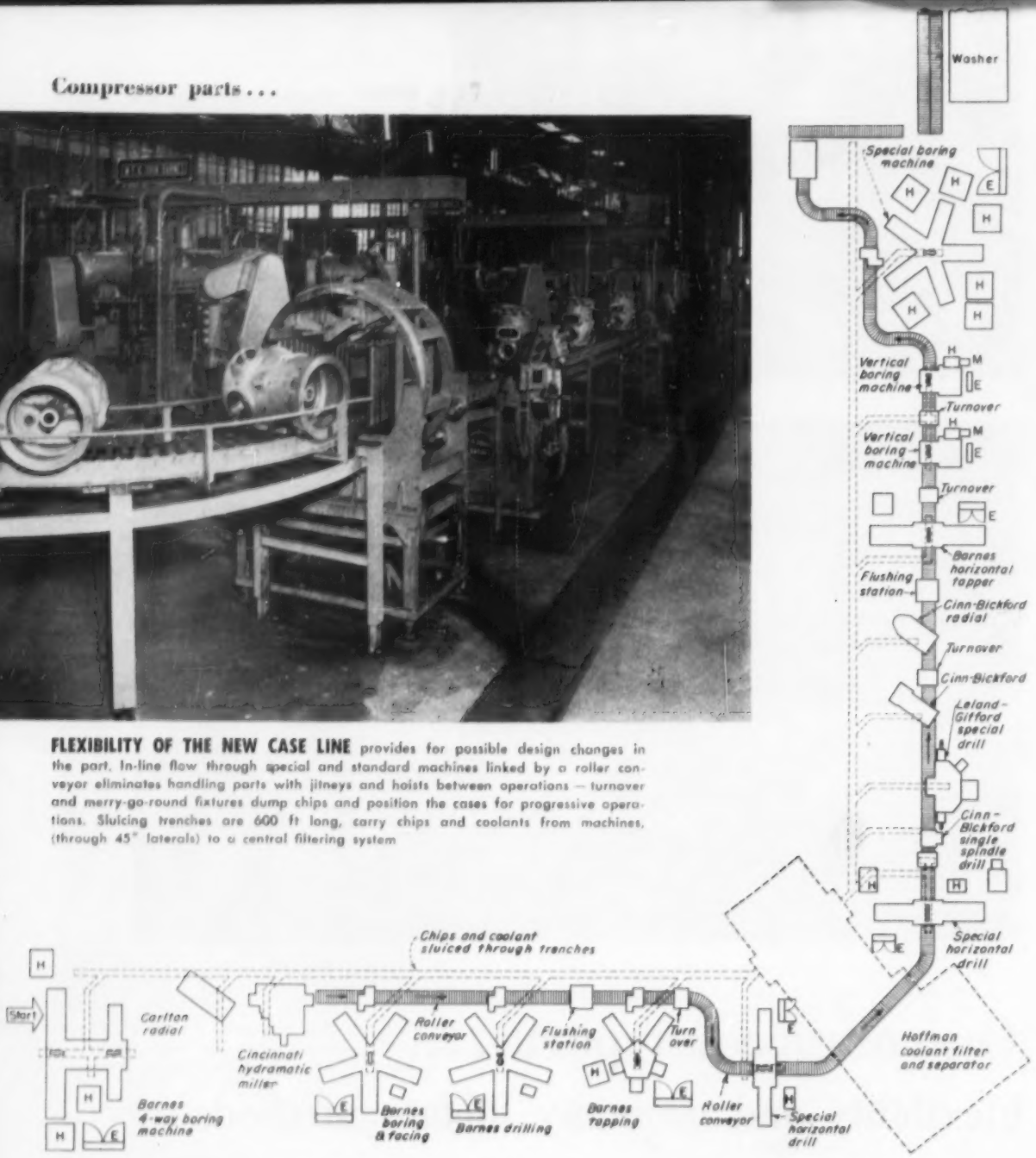
Need to cut costs and increase production inspired installation of new machines, new tooling, and new methods for making compressor components at Airtemp Div of Chrysler Corp, Dayton, Ohio. A modernized line for making compressor crankcases includes standard machines as well as special, manual handling and automatic. Here are highlights of a program that jumped production more than 40%

GEORGE H DE GROAT, associate editor

Increased demand for residential and industrial air conditioners has made it necessary for Airtemp Division, Chrysler Corporation, to expand manufacturing facilities. One of the most-recent installations is a new line of 17 machines for processing compressor crankcases. Ten machines are specially built W F & John Barnes units that automatically bore, drill, tap and otherwise machine crankcases. Others are standard machines—all connected by a gravity-feed roller conveyor. Time saving gained by modernization is nearly two hours per case.

PROCESSING IS FLEXIBLE

Start of the new line is a Barnes 4-way boring machine where qualified castings are located on milled pads (machined in the foundry), for rough facing, boring, and drilling and reaming process holes in each end of the case. These holes are used throughout the rest of the line for locating. A Carlton



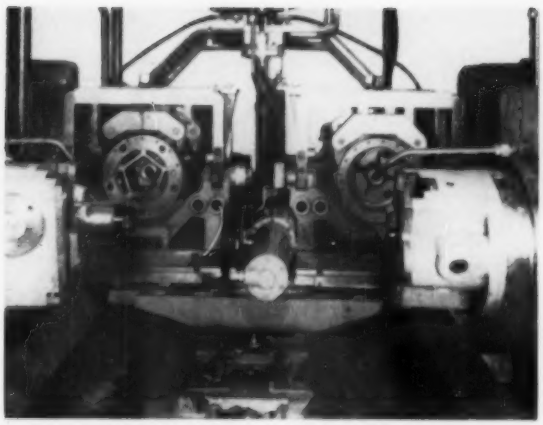
FLEXIBILITY OF THE NEW CASE LINE provides for possible design changes in the part. In-line flow through special and standard machines linked by a roller conveyor eliminates handling parts with jitneys and hoists between operations — turnover and merry-go-round fixtures dump chips and position the cases for progressive operations. Sluicing trenches are 600 ft long, carry chips and coolants from machines, (through 45° laterals) to a central filtering system

radial drill is next for core drilling the crankshaft bearing hole to eliminate runout in a subsequent boring operation. After this, a Condulet pad is milled on the case in a Cincinnati machine. In general, standard machines are employed for simple single operations, the specials being reserved for more-complex work. In this way, greatest savings are gained with minimum investment.

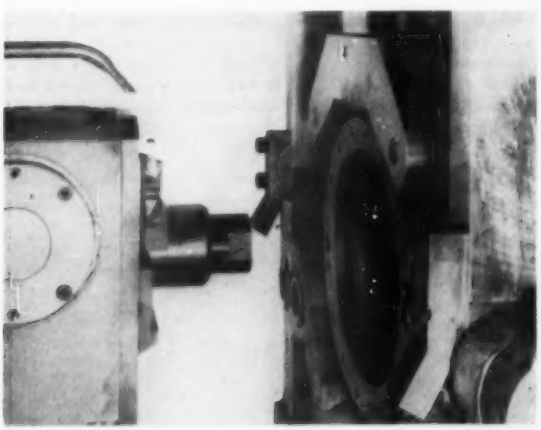
Next three machines are also special Barnes units. In the first, a 5-way boring machine, five cylinder-liner holes are rough bored and faced. The second is a 5-way drilling machine where all cylinder-pad mounting holes are produced, and the third, a 5-way tapping machine taps the same holes. These three machines eliminate time spent in indexing and trouble in holding radial location with former setups. A special horizontal drilling machine produces 16 holes in the stator end of the case and 15 in the cylinder end.

Another standard machine is a Cincinnati single-spindle unit for drilling, reaming, and spotfacing an oil hole. Such setups, intermixed with high-production, special-purpose machines, provide a means of making product design changes quickly without upsetting costly production equipment.

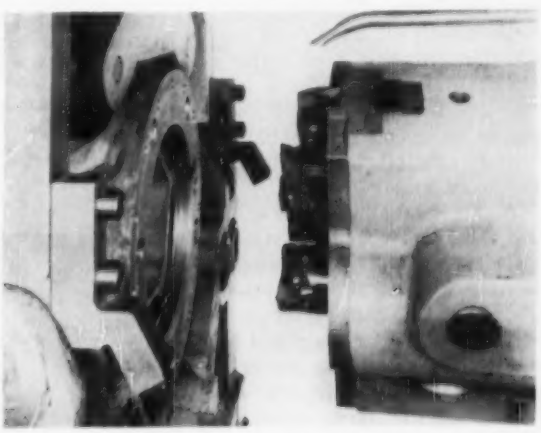
Hub and cylinder and stator ends are then finish bored in a special horizontal machine, after which all deep holes are produced in a standard Leland-Gifford machine. Next oil holes are drilled in a Cincinnati Bickford, followed by the tapping of two holes with a Cin-



MULTIPLE OPERATIONS on compressor crankcases are performed in this Barnes machine, first in the line. Cylinder ends (shown) and stator ends are rough faced and bored and two construction holes are bored, reamed and chamfered simultaneously in this 4-way machine. One operator loads and unloads a special 2-station holding fixture that indexes 180° to present work to the tools. In the first position, the generating head on the cylinder end feeds in with special Wesson Multicut holders to rough-bore, feed-out face the end, chamfer the bore and feed-out face the web. Simultaneously, an opposing head at the stator end roughs the outer bore, roughs and faces the inner bore, feed-out faces the end and chamfers the bore. Two settings are employed in the second position. First, two construction holes are bored and chamfered at each end with combination tools—then the fixture indexes 6½ in. and these holes are reamed



CARBIDE TOOLS produce 3600 pieces between grinds compared with 250 with former tooling. These insert-type tools are employed in the first machine in the line for rough boring, facing, and chamfering ends of the cases. Average stock removal runs from ⅛ to ⅜ in. and over-all concentricity is held within 0.001 in.



Feed at both cylinder and stator ends of the C1 cases is 0.9015 ipr at 88 rpm. Special holders with solid carbide inserts permit indexing to provide as many as eight cutting edges on some inserts before sharpening is required. Tool-change time is cut considerably by eliminating removal of the entire tool for regrinding

cinnati radial drill. Another Barnes horizontal machine then taps 31 holes previously drilled in a similar setup and simultaneously presses bearings into the crankshaft hole.

Final operations include facing stator and cylinder ends and the hub in vertical boring machines, where generating cuts are employed to produce an airtight seal between the compressor and the top and bottom covers. A 6-way boring machine finish-bores five cylinder-liner holes, generates the liner seat, and line-bores the babbitt bearings. Former difficulty encountered in holding radial location and critical dimensions from the center crankshaft bore to individual liner seats is eliminated by this setup.

NEW TOOLS CUT COSTS

Carbide tools are used throughout the line with outstanding results. In many setups, Wesson band-type "Multicut" holders are employed with solid carbide inserts. All band-type holders are permanently fixed to Davis heads with keys, dowels and bolts and new cutting edges are obtained by indexing rather than removing the entire tool setup for regrinding. Carbide inserts for roughing and finishing are standard shapes and lengths except where special forms and radii are required.

Formerly, one of the big problems in machining the crankcases was tooling. Excessive tool breakage and changeover time, short tool life and considerable time in sharpening cutters contributed to

high costs and low production rates. In some setups, tool-change time ran about eight minutes, is now reduced to 42 sec. The new Wesson tooling is easy to set up, quick to adjust and lasts much longer between grinds. Contributing to the speed—and accuracy—of insert adjustment on these new holders is a "gaging" device. Adjusting the insert until the top is flush with the edge of the insert slot sets insert height to within 0.001 in.

Three complete sets of tooling are on hand, one in the machines, another in adjacent tool boards, and the third being sharpened and preset.

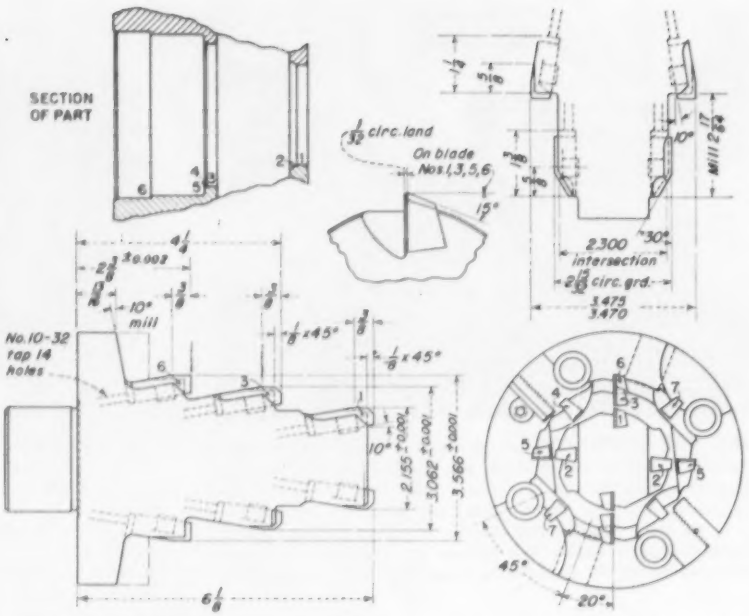
CHIPS AND COOLANT PROBLEMS SOLVED

Three problems were encountered in setting up the chip-handling system. First it was necessary to select a chip conveyor that could handle CI chips from twelve additional machines on a line adjacent to the 17-machine crankcase line. Second, a suitable coolant had to be selected, and finally the best soluble oil for the machines had to be chosen.

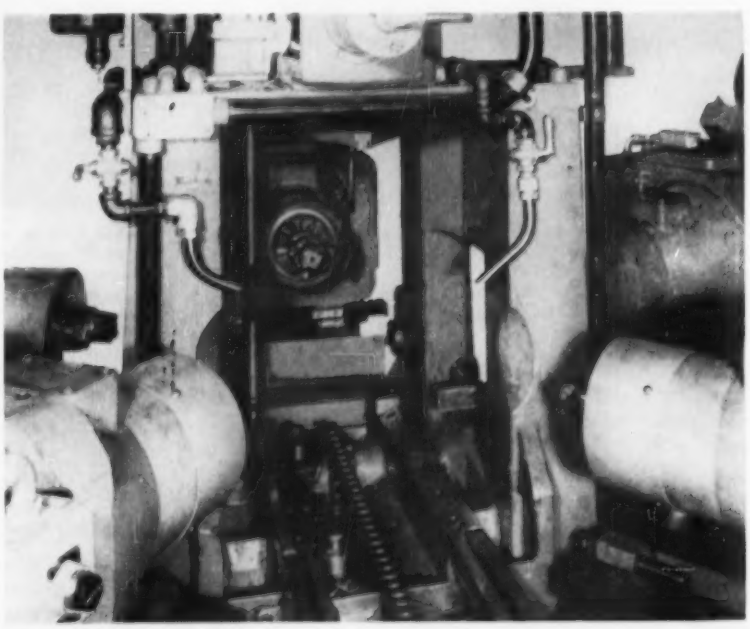
A sluicing method for transporting chips and coolant to a central filter and chip-disposal system was devised to solve the first problem. This type of chip conveyor was selected over drag chain and tubular conveyors in the belief that sluicing would require less maintenance and would be more adaptable to future expansion. Moreover, because all machines in the automatic line required coolant, a small increase in pump and filter capacity would satisfy future chip-handling needs.

Because machine bases could not be split by a conveyor, lateral trenches approaching a main trench from the machines were installed. Pitched at 1 in. per ft, the laterals join the main trench at a 45° angle. All main trenches are pitched at $\frac{3}{8}$ in. per ft and, with proper nozzles, provide a minimum velocity of 8 fps to move CI chips.

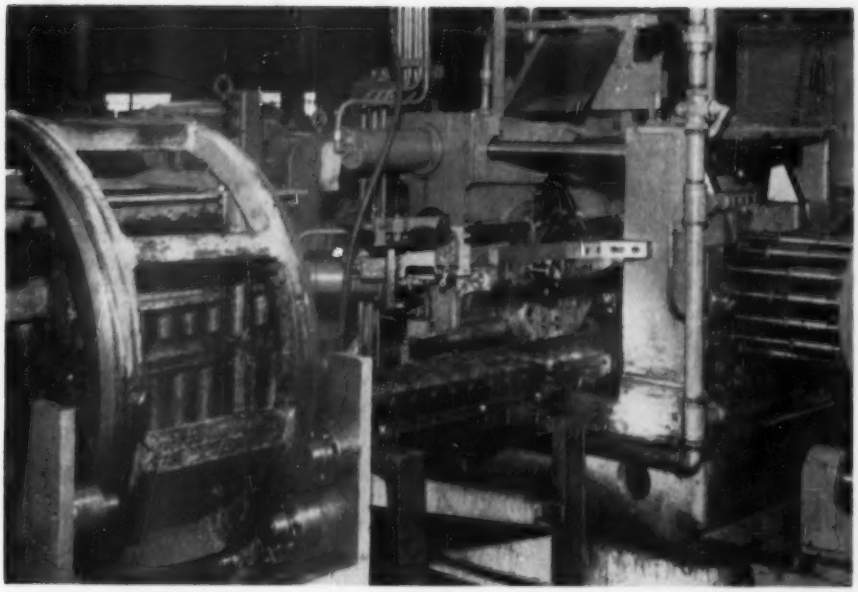
Magnetic, paper, disk and flotation filters were considered for filtering the soluble oil. Final choice was the flotation unit—base on the opinion that it would do a satisfactory cleaning job, would require



TYPICAL OF TOOLING throughout the line, this multiple-dia cutter for semi-finish boring CI has two blades for each dia — each set being equally adjustable. A 7° negative radial rake is employed on chamfering blades, no radial rake on boring blades, and a 5° positive axial rake is ground on all blades. Body is SAE 6145 steel, hardened and ground — grinding time is about 4 hr, compared with 12 formerly required



NEW 5-WAY MACHINE eliminates boring compressor-case cylinders one at a time. Cases are delivered automatically from a roller conveyor to a fixture on the machine conveyor and are automatically positioned and clamped. Rotating spindles on sliding ways advance to the operating position simultaneously for boring the web and bottom of the cylinder face, chamfering the seat, rough boring two stepped internal dias, boring and facing two other dias, chamfering another bore, and facing the cylinder flange



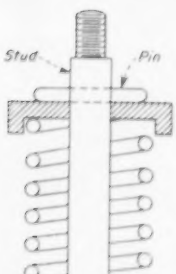
BUSHINGS ARE PRESSED IN PLACE at each end of the center hub while 15 tapped holes are produced in the cylinder end face and 16 in the stator end face. As the horizontal heads on this special machine move forward the bearings are pressed in before tapping begins. Turnover fixture indexes 90° to position cases with stator end up for facing operations that follow

a minimum of maintenance, would permit use of the same coolant for a longer period, and the method of separating chips and coolant by delivery of chips to a hopper was readily adaptable to this application. The filter, with these pumps, is located in a pit 40 ft long by 14 ft wide and is 12 ft deep. A tubular conveyor carries separated chips from the flotation-unit hopper to a buggy at floor level.

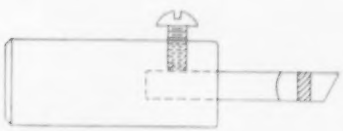
Coolant is a water-soluble oil with a concentration of 30 to 35 parts of water to one of oil. To provide rust protection for CI parts, an inhibitor is added. Total volume of coolant is renewed about once in nine months, and daily makeup is about 4½% of the total volume to replace coolant lost by evaporation and at the 29 machines. Regular additions of bactericide are made and a weekly bacteria count is made to prevent the count exceeding 10,000 bacteria per cubic milliliter.

Diemakers Kinks

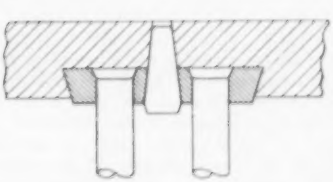
FEDERICO STRASSER



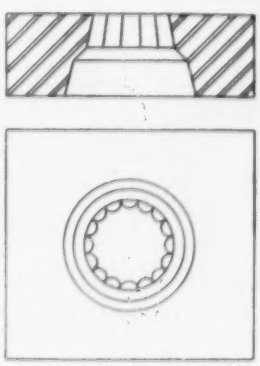
WHEN A SPRING pad must be moved from one press to another, it is best to do it with the device in the compressed state. This will facilitate assembly at the next tool. So, before dismounting the spring pad, slip a retaining pin into a hole drilled in the stud.



DRIFTS for cutting out the central slug in irregular die openings can be made from broken round punch bits. Grind the end of the bit to suit and mount in a soft-steel holder.



PUNCHES must be fastened securely to the punch holder. In this case, they are mounted in an auxiliary plate that fits a dovetail in the punch holder, and the plate is positioned with a taper pin.



DIE PLATES with complicated openings are more economically produced in this manner: Counterbore a large hole half way through the die plate. Thus, much less metal need be "whittled" away.

Shock simulator

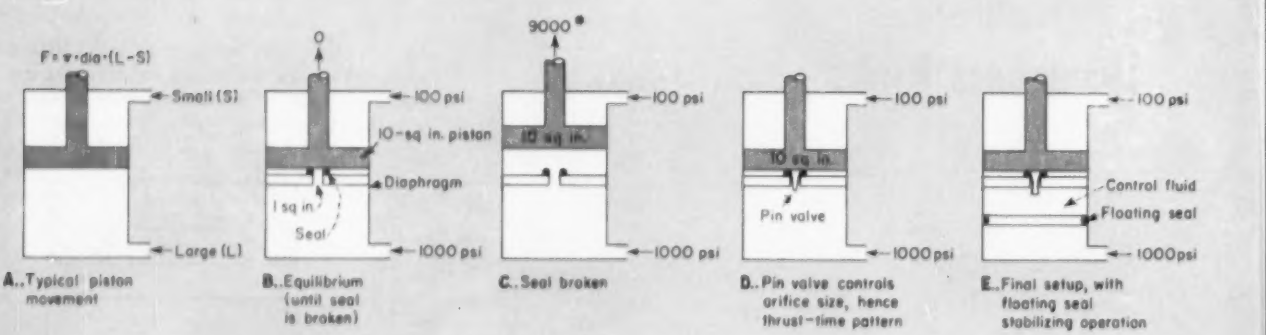
The inventor, Jack Ottestad . . .

. . . explains to Ralph Monsees (standing) of Convair the principles of his test setup of the Hyge. The upper two sections are the cylinder with the seal, the third section is the control-fluid area

Based on a familiar principle of physics, a new arrangement of piston and cylinder has real possibilities as a shock tester and as a press for high-velocity, high-impact forming of aluminum, titanium and some steel alloys. It provides a high-level controllable thrust-time curve, can be tandemmed or paralleled and self triggered

E J TANGERMAN, executive editor

Supersonic aircraft, missiles, steam or gas turbines under high loadings, ordnance equipment, and modern submarines exposed to depth-charge attack must have one thing in common—the ability to withstand terrific shocks. Speeds have been increasing so rapidly in the postwar decade—and resulting shocks as well—that conventional shock-testing methods are no longer adequate. Furthermore, it is advisable to be able to vary the shock-wave pattern. Drops of parts or models into a sandbox floored by instruments, blowout diaphragms and rapid-acting valves, or driving wedges into lead, are typical current test methods. But these do not provide reliable or predictable acceleration



A..Typical piston movement

B..Equilibrium (until seal is broken)

C..Seal broken

D..Pin valve controls orifice size, hence thrust-time pattern

E..Final setup, with floating seal stabilizing operation

Principle of the "Hyge" Device

A typical piston is acted upon by a force which is the difference between the pressure below it and that above it (neglecting rod area), times the piston area (A). But if a fixed diaphragm be placed below the piston, with an orifice topped by a ring seal against the piston, the pressure below will be a function of orifice size *until the seal is broken* (B). Thus, in the example sketched, 100 psi over the 10-sq. in. piston is balanced by 1000 psi on the 1-sq in. orifice below. But add, for example, only a pound or two of pressure below—to break the seal (C)—and pressure there becomes 1000 x 10, or 10,000 lb, creating a sudden differential of 9000 lb that drives the piston up sharply. This is the simple principle of the device.

The need, however, is for a controllable, high-level force with a predictable variation or curve. Acceleration control can be created by placing a metering pin on the piston base (D) and extending through the orifice. Pin shape at any given stroke will determine the speed with which the pressure fluid acts against the piston. Deceleration control can be provided by an orifice and metering pin on the opposite side of the piston. What's more, if a floating diaphragm be placed below the orifice diaphragm (E), with the "control fluid" between them, creating in effect a double piston, the operation can be further stabilized and controlled. Sketches are, of course, purely diagrammatic

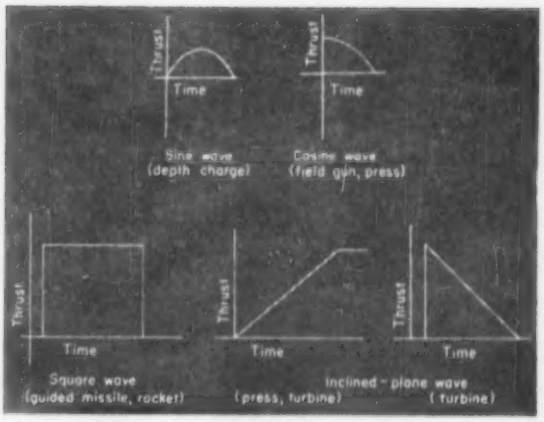
shows promise

or deceleration curves (thrust vs time pattern) required in present-day testing, such as is encountered in a guided missile.

What's more, there are indications that rapidly applied shock loads may cause better forming of aluminum, titanium and some steels. Gunpowder, spring loading, and trip latches on air presses have all been tested, but each offers complications. Perhaps a shock-testing unit can be adapted for the job. The theory is that a high-velocity technique will produce a better product than a slow-forming one.

Thus a new approach to these problems by Jack Ottestad of Convair-San Diego is particularly interesting. His device is essentially a piston in a cylinder, subjected to differential pressures on its two faces, and requires no complicated controls or elements like rapid-acting valves or blowout diaphragms. It has, in fact, only two moving parts—the piston and a floating seal. Its action is diagrammed in a series of sketches.

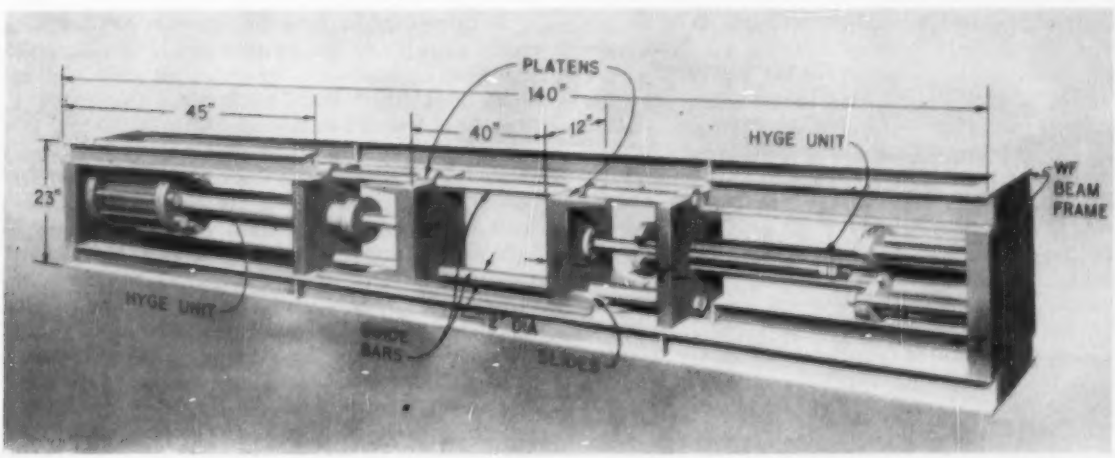
The device is now under an accelerated program of development. It has no rapid valves or blow-out diaphragms; it operates on the principle of rapid release of stored energy, and has only two moving parts. The 3-in. unit pictured here can develop 12,000 lb of thrust, and units can be teamed in tandem or parallel to multiply either thrust or the area subjected to it. Various shock patterns (see sketches) can be developed by designing appropriate metering pins. Regardless of shock pattern or number of units, they can be self-triggered.



Shock patterns attainable with Hyge

Consolidated Electrodynamics Corporation, Pasadena, Calif, has been licensed to manufacture and sell *standard commercial* shock-testing machines based on the principle. Convair itself has set up the Hyge Engineering Project in Claremont, Calif, to develop the principle further in the realm of special shock-testing equipment and high-velocity, high-impact press equipment. While any suitable gas can presumably be used economically, the most successful actuating fluid thus far has been bottled commercial nitrogen under 2000 psi.

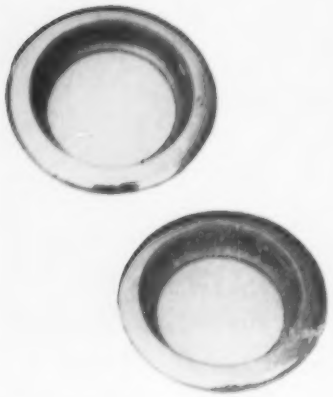
Several units have already been sold to outside organizations for shock-test use.

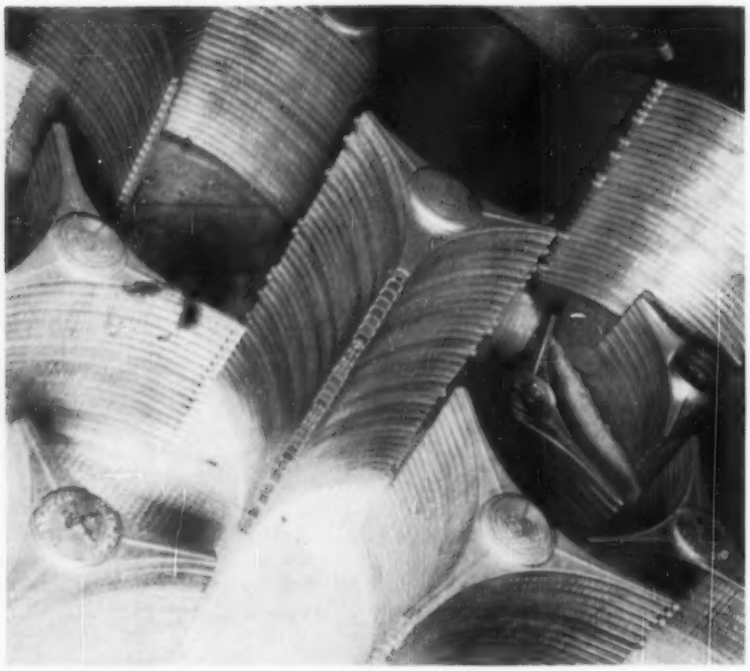


Prototype twin-ram arrangement

DESCRIPTION: Weight, 15,000 lb, but held by only four ¾-in. AN bolts because only static weight is transmitted vertically. Two standard 3 x 30-in. Hyge units (20-in. stroke). Guide bars carry no static load. Platens weigh 150 lb each. Could operate vertically or horizontally, total load transmitted to frame being 15,000 lb

OPERATING CHARACTERISTICS: Force on ½-in. stopping distance about 1,200,000 lb. Impact velocity about 100 fps; closing velocity, about 200 fps. Unit No. 1 triggers No. 2 with 2.5 milliseconds delay. Rebound controlled by compression ratio





Burner supports and rings . . .
. . . for a number of electric-range makers are produced in Type 201 by Tuttle & Kift, Chicago, replacing Type 301. Supports are used as is, rings are polished, then given a light chrome flash for increased resistance to heat tinting

Low-nickel austenitic stainless

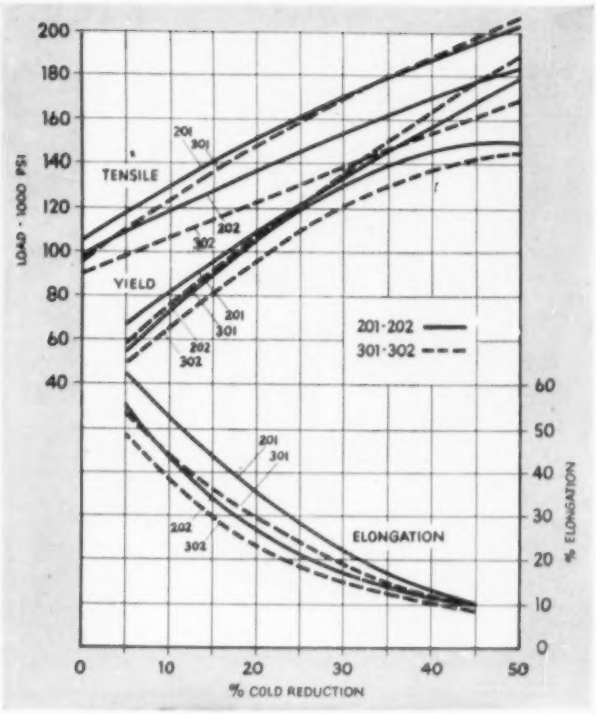
Types 201 and 202 can handle most jobs formerly done with 301 and 302. A summary of characteristics based on data just released by the Committee of Stainless Steel Producers, AISI

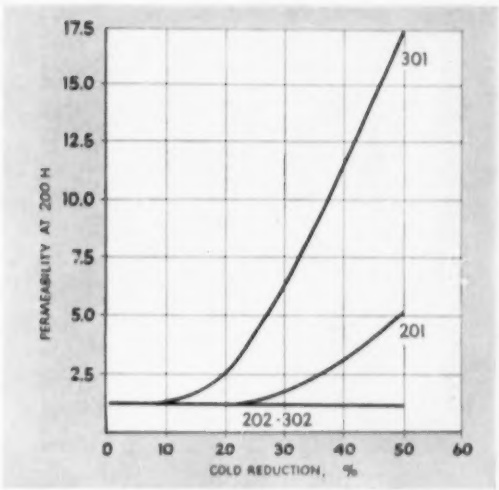
Low-nickel, high-manganese stainless steels, under study for 20 years, are now recognized in two standard compositions—AISI Types 201 and 202—a new family. A similar type was used in transportation equipment during World War II (17% Cr, 4% Ni, 4% Mn), but presented some difficulties from the breakage in cold forming operations, which was the result of the high work-hardening rate of this particular composition. Limiting of nickel in most civilian goods to 1% max during the Korean Emergency resulted in a 15%-Cr, 1%-Ni, 17%-Mn, alloy, comparable in mechanical properties to AISI 301 but not nearly as good in corrosion resistance or hot workability. Similar types now under study, however, have higher nitrogen contents and bid fair to beat these problems.

Production of the new AISI Types 201 and 202 last year was under 2000 tons, but will be much greater in 1956, and some leaders expect the new family to eventually replace Types 301 and 302 in perhaps 80% of current applications. This is because demands for stainless are rising faster than production of nickel, and other demands for nickel in high-temperature equipment are increasing.

Both new types have 0.15 C max, 0.060 P max, 0.030 S max, 1.00 Si Max, and 0.25 N max. Type 201 has lower proportions of other alloying elements than does 202. It has 5.5-7.5% Mn, 16.0-18.0% Cr, and 3.5-5.5 % Ni, compared with 7.5-10.0 Mn, 17.0-19.0 Cr and 4.0-6.0 Ni for 202. Nitrogen content is held lower than 0.25% (currently 0.10 to 0.20 N) because greater amounts are unnecessary and in certain cases, properties and workability might be affected by higher amounts. Recommended annealing temperatures are cut 50 to 100 F for the new grades because of a tendency to more-rapid scaling at high temperature, and pickling temperature cut 10 to 20 F with lower hydrofluoric concentration to prevent overpickling.

Compared with Types 301 and 302, modulus of elasticity is slightly higher in the new family (28,-600,000 psi in tension), coefficient of expansion about the same, yield strength up to 55,000 psi, tensile strength up to 115,000 psi for 201 and 105,000 psi for 202, elongation 55% in 2 in., hardness R_B 90. These help the low-nickel types in some specialized forming procedures. Rupture strengths compare favorably with Type 347, are better than 304. Short-





Austenite transformation . . .
. . . from cold work does not occur as rapidly in Type 201 as in 301. Types 202 and 302 are alike

Typical work-hardening characteristics . . .
. . . of Cr-Ni-Mn steels compared with Cr-Ni grades. Results are of single tests

standardized

time high-temperature test results show 201 much better than 301 or 302, scaling resistance as good up to 1500 F. Impact properties are like those of other austenitic stainless types.

Work-hardening in the Cr-Ni-Mn types is about the same as that for equivalent Cr-Ni grades. Corrosion resistance of the new types is nearly equal to that of Types 301 and 302. They are also subject to stress corrosion to the same degree; therefore Types 201 and 202 should also be given a final solution anneal after fabrication or welding if stress-corrosion conditions exist.

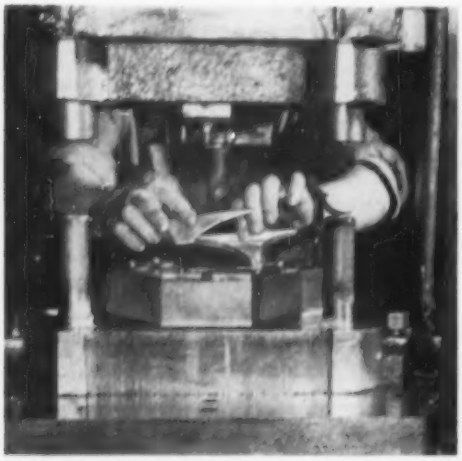
Response in both shallow and deep draws is much the same as that of 201 and 202, as it is in draw-bench and roll forming and in brake bending. In drawing, however, holddown pressures must be adjusted to prevent wrinkling which might result because of higher yield strength. In general, tooling need not be changed from that for Cr-Ni types for most standard operations. Embossing may require some tool changes because of the greater hardness and stiffness of the new types, or some clarity may be lost.

In welding, the Cr-Ni-Mn alloys have shown a reduced tendency towards intergranular precipita-

Rings are blanked . . .
. . . and preformed from 0.020-in. No. 2 strip on a 150-ton Warco straight-side press. They are in two diameters, the smaller (6 in.) being shown

PLEASE TURN PAGE

Low-nickel austenitic stainless standardized . . .



Supports are blanked . . .
. . . and center-embossed with range-maker's emblem, then flanged on this 75-ton Warco press. They are of 0.031-in. No. 1 strip

Type 202 has replaced . . .
. . . 302 at Bradley Washfountain Co, Milwaukee, for bowls, both of the circular (shown) and semi-circular designs. Stock is 0.095 in. thick a 48-in. square being used for the 36-in. dia bowl being drawn here

After flange edges . . .
. . . on Washfountain bowls are curled with a wiping die, they are machined in a vertical boring mill and attachment lugs are welded to the bottom

The 200 series . . .
. . . can be fabricated by even simplest methods. Here, cabinets for Scottowels are being assembled by hand soldering at D J Alexander Co, Philadelphia. No problems have been encountered in soldering, spot welding or brake forming

tion of chromium carbide in some tests. All welding techniques can be used interchangeably on these and the Cr-Ni types, and welding rods of either type can be used interchangeably.

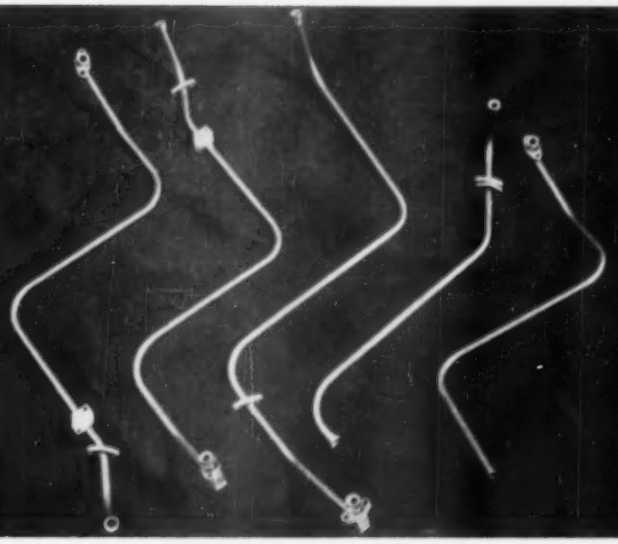
To sum up: Applications to date have been entirely successful. Slightly lower corrosion resistance may limit applications in certain cases, for example, where certain chloride compounds are present. In general, Type 201 can replace Type 301, Type 202 can replace Type 302—but if Type 304 or better is actually required, the Cr-Ni-Mn series are not recommended.

Latest

American Machinist

SPECIAL REPORT NUMBER 420

SILVER-BRAZED AIRCRAFT PARTS include an ejection-seat component made up of a stainless-steel cam and a low-carbon-steel shaft, upper left. At right is a stainless oil filter, at center a copper and stainless-steel wall screen. Two brass gear segments, bottom, are joined to steel dial pointers. ⅜-in.-dia. Type 304 stainless hydraulic tubes and fittings are joined with a 45% silver-brazing alloy and low-temperature flux (lower left)



Latest silver-brazing techniques . . .

Strong joints that must resist shock, corrosion, and high working temperatures are essential in modern assemblies. Closer-tolerance parts, new metals, brazing materials, fluxes and heating methods — all these have mushroomed applications of silver-alloy brazing. Automotive aircraft, appliance, business-machine and electrical manufacturers are also multiplying applications. Here is a roundup of latest practice and equipment, selected from a number of industries and plants

. . . simple for short runs

. . . fast, efficient for mass production

. . . special for special materials

G H De GROAT, associate editor

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Torch brazing . . .
joins "eye" of loop in making aircraft ground-lock pins. Low-carbon steel tubing is formed, then washed in carbon tetrachloride before joint is made with "Easy-Flo" silver-brazing wire. Swivel fixture simplifies positioning the work for even distribution of heat and wire

Extensive applications . . .

Extensive applications of silver-brazing occur in nearly every branch of Metalworking. In electrical manufacturing it is employed for joining contacts, transformer leads and taps, making switch gear and electronic tubes. Appliance manufacturers silver-braze sheet metal and tubing. In the automotive industry, it is employed for assembling gas-tank components, transmission parts, tractor gear rings, instruments, shift levers, timing-gear stampings, and many others. Pistons, actuators, instruments, control rods, and linkages are among the numerous aircraft parts assembled by silver brazing. Aircraft thermocouple wires and automotive thermogages are typical of parts joined in this manner for mechanical strength in high-temperature operation.

Step One—clean metal

Of the many techniques employed, all make use of similar precautions to insure good results. One of the most important is clean metal. Surfaces are always washed free of grease, oil, oxide film, scale, and other contamination. Both chemical and mechanical cleaning are employed and—when liquid or gas-tight joints are required—extra care is taken to clean work thoroughly because dirt is the most common source of pinholes. Degreasing with trichlorethylene vapor is in wide use, as is simply washing the parts in mineral spirits. In any case, cleaning is most effective when done immediately before brazing to prevent recontamination.

Flux is important, too, in obtaining a solid, homogeneous joint by preventing oxidation during heating, dissolving residual oxides and those that may form during brazing, and in aiding free flow of the brazing alloy. Flux should be fluid and active below the melting point of the alloy and should remain stable, with little or no tendency to evaporate at brazing temperatures.

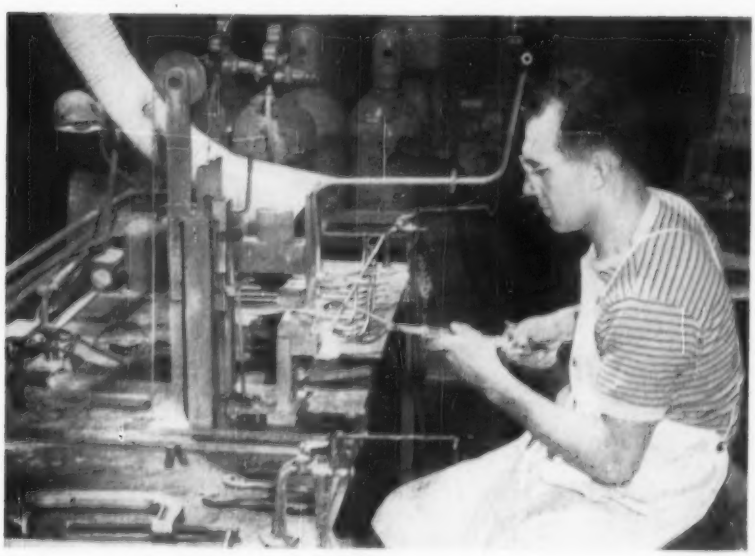
In addition, it must be easy to remove from the work afterward. Generally, a hot-water bath will remove flux without difficulty. Commercial fluxes meet these requirements and are applied in a number of different ways, depending upon the job and circumstances. In some automatic operations, flux, in powder form, is sprayed on the work, in other cases a paste is spread over the surfaces to be brazed. Dipping parts or rolling them in liquid flux is common, as is applying the flux with a brush. In almost all cases, however, flux is applied immediately before brazing—right after the work is cleaned.

The importance of flux is illustrated by recent successes in joining chromium carbide by silver brazing without special equipment—largely because of the application of a flux containing metallic boron. Chromium carbide forms a film of chromium oxide

Latest

Pliers, fixture, and torch . . .

are the only tools needed for joining contact points to leaf springs in low-volume production. Fixture holds 20 contacts, previously fluxed, while leaf springs are held in contact with them, one at a time, for brazing



Mutiple-tip torch . . .

insures even distribution of heat in joining fittings to small-dia hydraulic tubes. Fixture simplifies positioning and clamping of irregular shapes, is operated by a pedal to free operator's hands. Brazing alloy is 45% silver in ring form

at brazing temperatures whch cannot be reduced by general-purpose fluxes. Boron, a strong oxide former, reduces the chromium oxide and increases the capacity of a flux to absorb these oxides. The boron-containing flux dissolves the chrome-oxide film and promotes good bonding between chromium carbide and brazing alloys.

Clearances and fixtures

Average clearance between mating surfaces runs 0.001 to 0.003 in. on a side. This allows the free-flowing alloy to fill the joint by capillary action. To insure a good bond, one manufacturer of aircraft components applies sufficient brazing alloy to one edge of each member of a joint completely to fill the largest clearance likely to be encountered. In the case of blind ends, or joints that cannot be seen by visual inspection, filler metal is applied at both open and closed ends.

Jigs, fixtures, and other tools in which the work can be supported and clamped, run all the way from electrically controlled automatic and semi-automatic devices to simple plates or even pliers. More-elaborate setups provide high production rates and

Latest silver-brazing techniques...

usually more uniform results and less waste of materials. On the other hand, low-volume production doesn't often warrant more than the minimum essential for proper clamping and alignment. In addition, skill may be needed for joining especially complex assemblies; here, manual operations are often advantageous. Economy and quality are usually balanced for the individual circumstances.

Indexing setup increases production

A special high-production setup in an automotive plant is an indexing table with nine stations for joining U-shaped steel tubing to stamped oil-pump-filter covers. An operator places a pre-cut ring of silver-brazing alloy over one end of a tube, inserts this end into a pierced hole in a cover, applies flux with a brush, then loads the assembly into a nest on the table. Leaf springs clamp covers in nests, and the portion of the assembly to be joined overhangs the table to pass over two gas burners.

Having two heating stations cuts the indexing period and raises production rate—one operator produces 300 joints per hour. A continuous stream of soluble oil at a station beyond the brazing station cools the assembly and removes excess flux. A 12-sec indexing period permits the operator ample time to prepare and flux each assembly, then to load it.

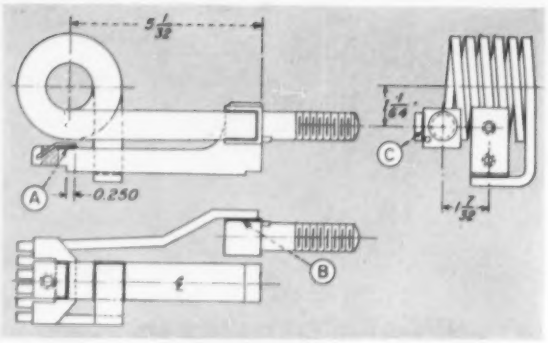
Prepared inserts help

Prepared inserts of brazing alloy are of considerable advantage. In many cases, especially for joining tubing and fittings, they are cut from rectangular strips or round wire. These can then be inserted in grooves in the work or at the joint on top of the members to be brazed. Inserts are made large enough to provide sufficient alloy to allow some excess material.

Advantages gained by inserts include control over the amount of alloy used—thus avoiding waste—and good distribution over joint surfaces. Application of alloy and heat are divided into separate operations with prepared inserts, thereby facilitating high-speed production. In addition, they allow an operator to devote full attention to heating the work.

Inserts in the shape of washers or spacers are frequently made from brazing alloy-sheet from 0.003 to 0.010 in. thick; they produce good results when lap or scarf joints are made. After the joint is complete, alloy thickness is about 0.002 to 0.003 in. —in intimate contact with the entire surface. Slight, but uniform, pressure is often applied in brazing with inserts to insure good contact between joint surfaces when the alloy melts.

Some high-volume operations make use of ferrous or non-ferrous metal strip clad on one or both sides with 0.002- to 0.005-in. thickness of alloy. This pre-clad stock is stamped to produce washers for butt joints, shims for butt and shear joints, sleeves for tubes and sockets, irregular shapes for inserts, and numerous other forms. In some instances, entire parts are made from clad strip stock; thus the alloy is automatically pre-placed so blind joints and joints of large area are readily formed.



Silver-brazed assembly . . .

of a blowout coil for an automatic dc magnetic contactor is handled in sequence to avoid problems with different materials. Brass bracket for a blowout ear spacer is first joined to a brass contact bracket, (A). Next, the copper coil is brazed to a brass stud, (B) and then this sub-assembly is joined by brazing to the contact bracket at C

Where blind joints are unavoidable in conventional assemblies, the clad alloy is especially useful because it doesn't require prepositioning, nor is it necessary for capillary action to distribute the silver; flow of the alloy is controlled and joints are free of voids. Fixtures and joint fits must be somewhat more accurate than in ordinary brazing because there is no excess silver alloy to fill gaps and voids.

High-speed gas heat

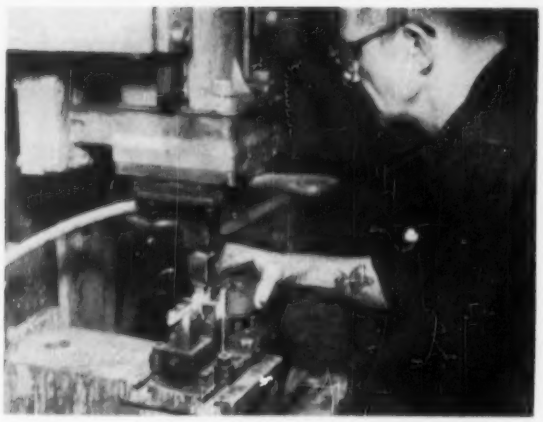
Copper shims clad with silver-brazing alloy are used extensively by one cutting-tool manufacturer to join carbide tips to steel shanks in special Selas brazing machines. One machine has four heating stations, each of which has a pair of burners that resemble miniature jet furnaces. A commercial gas is burned in a ceramic-lined, high-pressure combustion chamber. The ceramic lining acts as a catalyst to speed and complete combustion within the chamber.

Superheated gases are directed at the tool shank, and thereby conducted to the tip. This avoids thermal shock and resulting damage to the tip. Operation is fast and simple, the heating cycle being automatically controlled by vernier-set electric timers. The pre-assembled tool insert and shank—with pre-placed silver-copper shim stock and brazing flux—is positioned between the burners and the operator presses a button which turns the burners from idling flow to full-on. The timer then takes over and the operator is free to load other brazing stations. At

Latest

Special holding fixtures . . .

aid in joining a brass spacer bracket to a brass contact bracket. Here, a 100-kva spot welder with copper electrodes provides heat precisely at the joint. "Easy-Flo" and paste flux has been applied prior to adding "Silfos" silver filler



Joining a copper coil . . .

to a brass contact bracket requires a good electrical bond rather than high mechanical strength. Pressure applied by spot welder insures good contact, permits joining areas as large as 1 sq in.

the end of the cycle, the burners automatically turn down to minimum flow, allowing the joint to set sufficiently for removal.

Furnace setups

Furnace brazing is the standard method of handling high-volume production. Furnaces are either gas or electrically heated, both types equipped with continuous-mesh belts for conveying work. One of fairly recent design is a gas-heated Surface Combustion muffle unit that can be used with a protective atmosphere.

The muffle is a special alloy steel for maximum operating temperatures of 2050 F, or one of silicon-carbide construction can be employed for higher temperatures. A long, water-jacketed, cooling chamber drops the work temperature sufficiently to avoid discoloration at the discharge end, thus eliminating cleaning operations.

The woven-mesh conveyor belt is made of alloy steel and is driven by a rubber-covered drum at the charge end. It is returned on rollers outside and under the furnace. A take-up mechanism keeps the belt under uniform tension.

Recently, furnace brazing of titanium has been accomplished by the development of nickel-titanium brazing alloys. Silver-copper alloys form brittle, intermetallic layers from diffusion of one element into another during the relatively long furnace-brazing cycle (torch and induction heating, being quicker, do not present this problem). For high-volume production, however, furnace brazing is essential. A standard wire-resistance tube muffle furnace with tank argon is used, and the newly developed nickel-titanium alloy is self-fluxing as far as titanium oxides and nitrides are concerned.

High melting temperature . . .

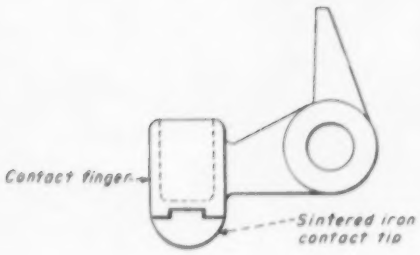
of Easy-Flo paste flux used with silver filler in brazing a copper coil to a brass stud eliminates damage to the joint in subsequent brazing operations. Temperatures used in silver brazing prevent embrittlement of the copper coil

Vacuum brazing titanium

Another recent development in silver-brazing titanium requires no fluxes and permits simultaneous, multiple operations. Developed by Wall Colmonoy Corp, the process is actually a form of vacuum brazing at temperatures well below those used conventionally. Work to be brazed is assembled with brazing-alloy shims, placed in a retort and weighted to insure positive contact.

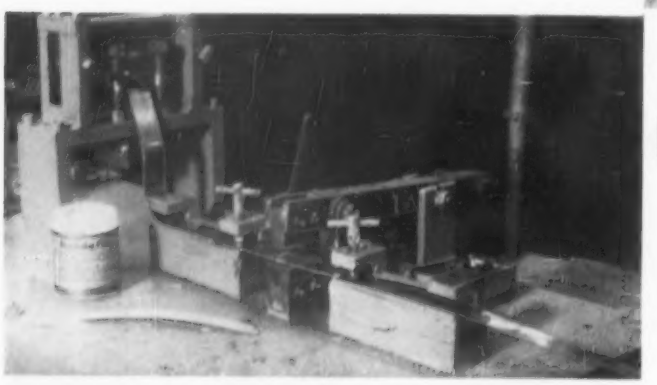
A cover is clamped on the retort, after which it is placed in a vacuum furnace where actual brazing takes place. Wetting and flow characteristics are good and insure complete brazing. This permits the brazing of complicated shapes as well as parts in

Latest silver-brazing techniques...



Powdered metal and brass . . .

are silver brazed to make a contact-finger assembly for master control switches. Sintered-iron contact tip is later oil impregnated while hot from brazing for long life in operation and good continuous sliding contact. Resistance pulse brazing is done in a 25-kva spot welder with Silfos filler and Handy flux



Continuous copper strip . . .

is made by resistance brazing in carbon block jaws. High-frequency current heats 0.072-in.-thick by 1¾-in.-wide pure, soft copper and (with pressure) provides a joint with good mechanical strength and contact for electrical characteristics. Strip copper is fed through the brazing setup from supply reels to a tension roll for winding into coils for industrial lift magnets. As each supply reel is exhausted, the end of a strip from a new reel is joined to the end of the strip on the tension roll by means of a lap joint 1 in. long

which titanium components have been assembled prior to application of the brazing alloy.

Salt-bath brazing

Another recent production method utilizes the salt bath. Here components to be joined are assembled with alloy inserts in place and immersed in a molten mixture of barium, sodium, and potassium chlorides. Brazing alloy melts and flows into all joints in seconds—after which the assembly is removed from the bath and cooled. Solidification of the braze, of course, occurs immediately.

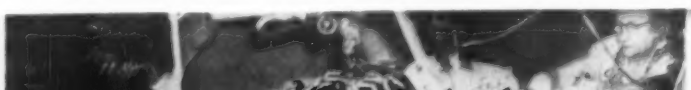
Temperatures are held uniform throughout the bath within plus or minus 5 F so distortion caused by non-uniform heating is eliminated. Moreover, an assembly can be immersed just deep enough to cover the joint, then removed before the rest of the metal gets hot—another means of preventing distortion. Another advantage of this technique for high-volume production is the speed with which parts are heated, usually four to six times faster than in a radiation-heated furnace because heat transfer to the work is by direct conduction. In addition, large numbers of small assemblies can be handled at one time.

Molten salt envelops the part and protects the metal from scaling and decarburization during brazing. Afterward, during cooling, the metal is protected by a thin film of salt until dissolved in a quench or rinsed off. Thus, assemblies can either be cooled in air or quenched in water without cooling chambers or protective atmospheres.

No flux is needed in joints that are fairly accessible, because the salt bath incorporates its own fluxing action. Combination of carburizing or other heat treatments with brazing is sometimes accomplished by using activated salt baths.

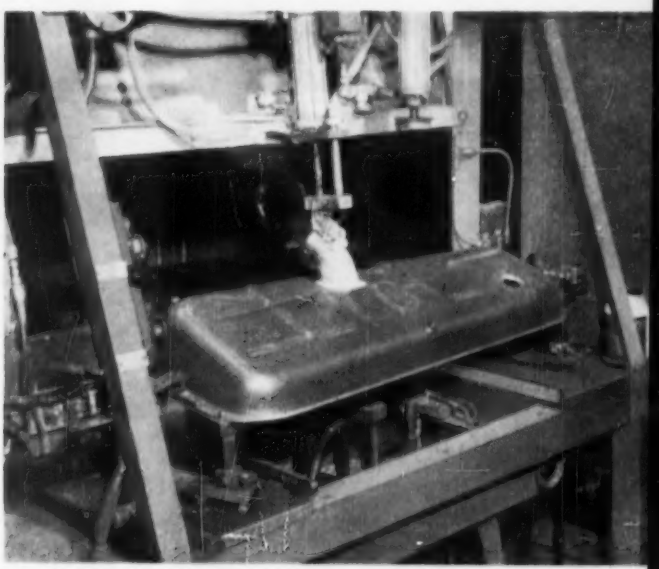
Blind joints, of course, present a real problem because they trap molten salt and require drainage holes or complete redesign. The process is best employed for long production runs. When not in use, the bath must either be maintained in a molten state or remelted later. Either presents considerable power expense.

Latest silver-brazing



Preformed silver-alloy rings . . .

are positioned on a truck gas tank after applying Handy flux to the surface for dissolving oxides and good wetting action. Gas-tank neck is fitted over the ring preparatory to automatic brazing

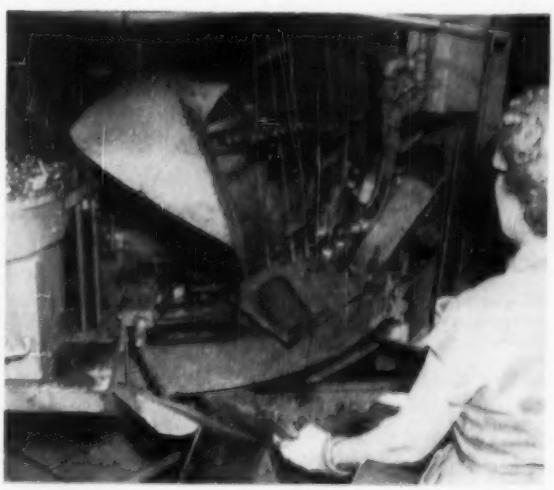


Automatic induction-heating . . .

unit for silver brazing truck gas tank and filler-neck assembly is manually loaded from a roller conveyor behind the operator who operates two 33-kw Weltronic units. Electrically controlled air-operated fixtures position and clamp the work, are tooled to handle seven different types of gas tanks. Induction coil is automatically positioned after clamping. At the end of the predetermined heating cycle, compressed air is applied to the joint to speed solidification of the silver. Automatic ejection to a roller conveyor follows. Total cycle time is 30 sec per tank

Special machine . . .

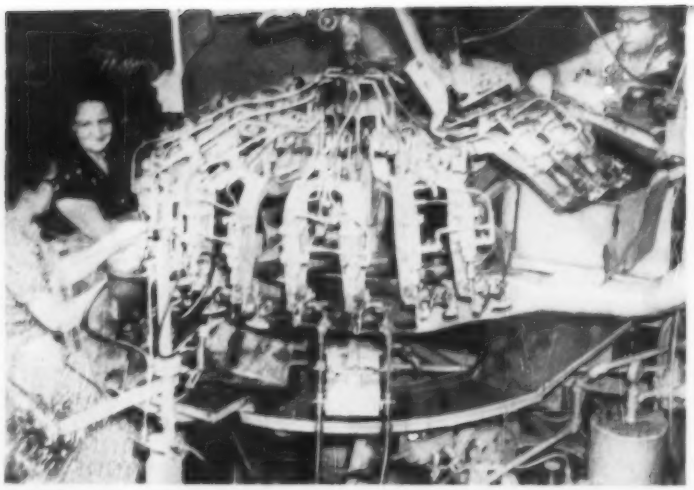
speeds high-volume production of automotive thermo-gages. Here silver filler and flux paste are applied to manually loaded steel capillary tubes. Nests on rotary table contain brass bulbs previously loaded automatically from a vibratory hopper feeder. An automatic positioning device sets the tubes so that the ends are at predetermined distances from the bottom of the bulbs. Clockwise rotation of the table carries work to brazing station



Gas flame heats . . .

rotating tubes and bulbs as they are carried to the brazing station in this special setup. After quenching to cool the brazed joint to facilitate handling and remove brazing flux, assemblies are automatically lifted from the nests, then manually removed from the machine by an operator

Latest silver-brazing techniques . . .

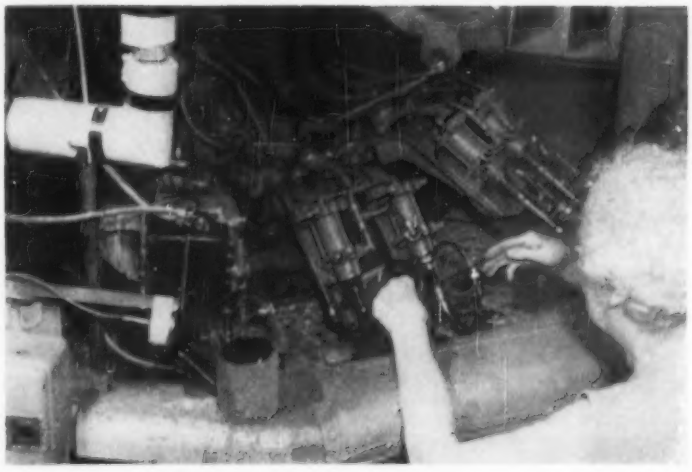


Automatic assembly . . .

of joined capillary tubes and bulbs to gage ends is handled in a special machine. Unit rotates counter-clockwise, with precut filler being applied to the components before they are manually loaded (at left) into clamping fixtures on a rotating table. Flux is applied automatically at the next station, after which the joint is made, center. After cam-actuated fixtures are lifted to enter water-test tank, air cylinders extend the work for immersion. Manual unloading, and conveyorized removal takes place adjacent to the loading station

Titanium honeycomb . . .

sandwiched between titanium face sheets is brazed with new vacuum process. Temperatures lower than those used conventionally eliminate distortion, avoid embrittlement and other problems generally associated with high-temperature brazing. Shim strips of brazing alloy are placed in position to separate titanium honeycomb from titanium face sheets



Pressure test . . .

in hot water at 200 psi checks thermo-gages for leaks. Inspector marks defective gages with red crayon when bad joints are indicated by bubbles, so they can be removed for cleaning and brazing again. Good gages are marked with paint as shown. Switch at left of operator turns air pressure on and off—water temperature is indicated by gage at left of paint pot

ACKNOWLEDGEMENTS . . .

We gratefully acknowledge the assistance of the following companies in preparation of this report:

Handy & Harman, New York, NY

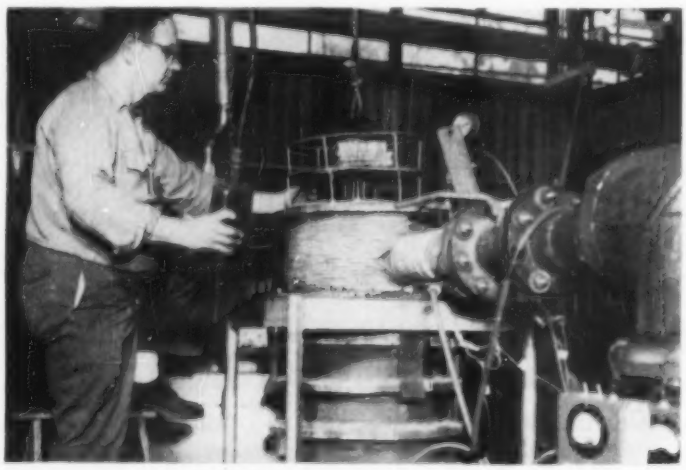
The Electric Controller & Mfg Co, Div of Square D Co, Cleveland, Ohio

Chrysler Corp, Detroit, Mich

A C Spark Plug Div GMC, Flint, Mich

North American Aviation Inc, Columbus, Ohio

Wall Colmonoy Corp, Detroit, Mich



Vacuum furnace brazing . . .

of titanium honeycomb section starts with loading sandwich assembly in a retort. Weights on top face sheet insure positive contact of all components during brazing. Retort is then lowered and clamped in vacuum furnace for joining the special parts

Round Table

Retirement Trade

"I was just wondering, Al, if industry couldn't work out some system where a man could transfer his retirement-pay rights when he transfers from one job to another."

"What's the matter, Ed? Thinking of quitting—or worried for fear you'll get fired before you collect your pension?"

"Not that so much as just realizing how little Social Security amounts to. Did you ever figure out what you'd get if you had to retire now?"

"Never did, Ed; but I know it's not much. But you can't get companies to transfer retirement rights. Some companies have retirement plans, but darn few of them are the same. Most of them have different rates and different requirements. And they keep changing every time a local union works out a new contract, too."

"I know, but what if they worked out some kind of pool idea? Each company could belong to the pool and contribute money. Then, when a man transferred from one company to another, providing they both belonged to the same pool, he could keep his retirement rights."

"You'd never get them to do it, Ed. In the first place, companies work these retirement plans through insurance companies and investment deals. I doubt if the insurance companies would work together. You know yourself that this company wouldn't be caught dead cooperating with one of our competitors. Besides, what can you do if a man leaves to work for a company that isn't in the pool?"

"Well, you could have a number of pools, with some sort of compensating fee set up when a worker transfers from one to another. What's the matter with that?"

"I'll tell you, Ed. The government has what they call anti-trust laws; and I'll bet that sort of thing would come under them."

"I think you're wrong, Al; not a non-profit thing like retirement pay."

"It looks hopeless to me, Ed. Best thing is to save your money and buy stocks and bonds; and insurance, too."

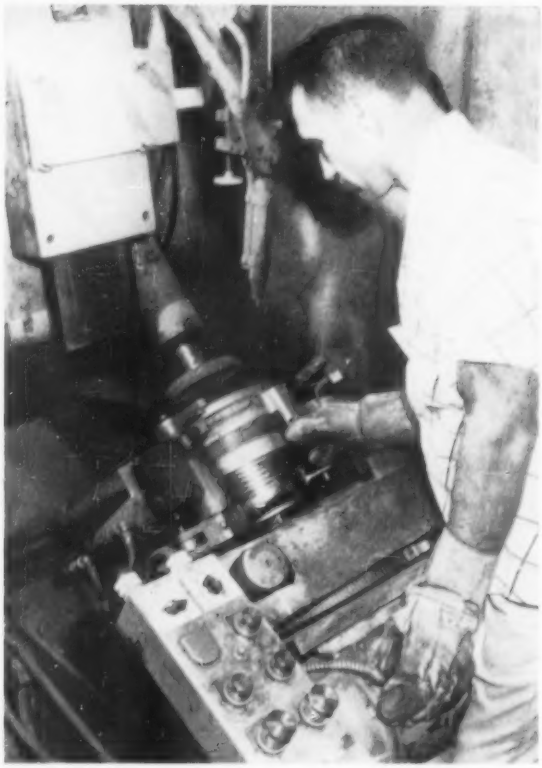
"But how about the guys who can't afford luxuries like that?"

***DOES ED** have an idea here? Could retirement pools be set up to keep a worker from losing out when he changes jobs—or gets fired? Your ideas may help others. Discussions of earlier topics start* *on page 209*

Straight-polarity welding produces air-tight joints

End heads are welded to thin sheet-metal compressor shells with a joint that must withstand 200-psi internal gas pressure without leaking. An automatic welding setup that cuts costs, improves quality and jumps production considerably over former methods is described

RALPH WARRENDER, welding engineer
WESTINGHOUSE ELECTRIC CORP. COLUMBUS, OHIO



ONE OPERATOR HANDLES 2 SETUPS in welding sheet-metal compressor components. Automatic controls speed production and improve quality

Welding sheet metal is well known as a tricky operation because thin material absorbs heat fast, expands rapidly and, on cooling, contracts with a tendency to distort and buckle. Add to this the necessity for airtight joints and you have an idea of the problems involved in joining end caps to shells in making refrigerator compressor assemblies at the Westinghouse Appliance Division.

Shells and heads, or end caps, are low-carbon steel about 0.078 in. thick, welded together by the shielded inert-gas metal-arc method with a single-bead lap joint. The material is checked for freedom from segregations, laminations, and harmful inclusions before any operations are performed, and, of course, the joints are cleaned prior to welding to remove scale, rust, dirt, oil, grease, and paint. In fitting the components, a maximum gap of 1/32 in. is allowed at the joint location.

AUTOMATIC LINE

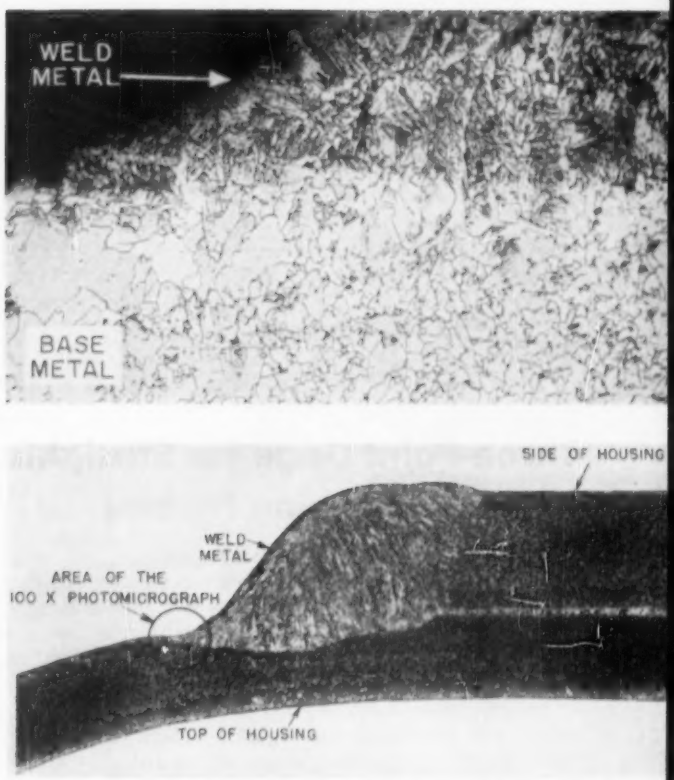
The welding line is automatic to the extent that a roller conveyor adjacent to the welders delivers components already assembled, and an overhead conveyor removes the assemblies. Most important, the welders themselves are automatically controlled. There are six welding setups in the line with three operators, one for each two machines. West-Ing-Arc welding controls include timers that automatically start and stop the arc, retract the welding heads, unclamp the work when the joint is made, and feed the welding wire as needed.

Straight-polarity dc produces a cooler joint at the work then other methods because the flow of arc heat moves from the work (positive-pole), to the welding electrode, or wire. The wire employed is 1/16-in.-dia Westinghouse M-S-20 shielded by argon and 2% oxygen at a rate of 28 cfh. About ⅛ lb of wire is used for each joint at wire feed of 266 ipm.

VERTICAL DOWN-WELDING

Special positioners are provided with rotating chucks in which the work is clamped automatically. These hold the work with its longitudinal axis at an angle of 30° with the horizontal, while the welding heads feed the wire in a vertical plane through the axis of the work. The wire is positioned at 45° to the joint face to clear projecting parts of the work. Distance of the head nozzle from the work is a maximum of 1½ in.

WELDED JOINT between end cap and compressor housing must be sound to withstand 200 psi air pressure. Hanson fittings are brazed in place after welding—are used to charge the assembly with dry air for pressure test



GOOD PENETRATION AND SOUNDNESS of the weld are evident in this cross-section and photomicrograph. Physical properties at the joint are superior to those of the base metal and are more than adequate for load requirements. Care in fit-up, (maximum 1/32-in. gap is allowed) permits high welding speeds, cuts operating cost

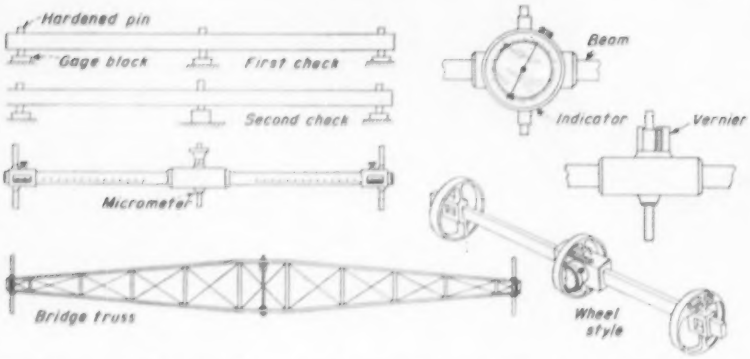
In operation, parts are delivered to the units from a dehydration oven where all moisture is removed at 275 F. Shells and heads are usually still hot when they are loaded into the positioner because welding must be done before the temperature drops to a point where the components might absorb moisture. Air-operated fingers locate and clamp the components in the positioner and a clamping head seats them securely. This head then automatically retracts and the rotating fixture turns the work through 370°, a complete circle plus 10° to allow for an overlap of ½ to ¾ in. Table rotation is started by striking the arc because the arc voltage actuates a relay that starts the table motor. Cam-operated switches, tied in with the rotating chuck, are adjusted to provide a minimum delay before striking the arc and ending it at the overlap. A time-delay resistor on the automatic control panel is adjusted to fill the crater when the chuck stops rotating. The welding head, of course, remains stationary at the joint while the work rotates at a speed corresponding to about 51-ipm welding speed. Actually, the turntable makes one complete cycle, including the overlap, in 32 sec, ± 5 sec. Welding current is 350 amp ± 10, and the arc voltage is 23 to 24.5. A protective device is set up to stop the electrode feed and open the welding current circuit if the chuck-rotating motor circuit fails.

INSPECTION AND TESTING

After the joint is made, the fingers automatically unclamp the work, the welding head retracts, the table reverses to the original starting position, and the operator unloads the positioner. Before loading the assembly on the overhead conveyor for transfer to the testing area, however, the operator checks each welded joint for uniformity and complete fusion. When any doubt exists regarding complete fusion, he manually welds the questionable area with a coated electrode.

Prior to arrival at the testing station, the compressors are assembled with Hanson fittings, terminals are tightened, and they are charged with dry air under 200 psi. Automatic immersion in water tanks permits inspectors to check for air bubbles that indicate leaks. Leak resistance has been improved considerably by this new welding setup. Previously, 8% of the total production required repair or rejection—now less than ½% are found to be defective at inspection.

Practical Ideas . . .



Three-Point Gage for Straightness Lines Up Machine Frames

How can you align three or more points on a frame or other large piece of work without using expensive equipment? The method I use is fairly easy and doesn't take much tooling.

Assume you have a bed on which you must align three points horizontally. First thing to do is get a long, rigid beam and drill three cross holes. Then grind up three hardened pins to press fit in the holes, making sure they are ground exactly the same length. Insert the pins to about the same depth, and put the beam on the machine—resting on the pins.

Now insert two gage blocks of equal thickness under each end pin, and measure with gage blocks the amount of gap under the middle pin. Turn the beam over (not end for end) and remeasure the gap—which will almost certainly give you a different reading. Then average the readings, and subtract from the heights of the end gage blocks. This gives you the amount of misalignment of the middle point, relative to the end points.

The difference between the dimensions of the end gage blocks and the average of the other readings is the amount of misalignment of the middle pin. Both the above results are not counting the effect of beam deflection because of weight.

To find the deflection due to weight, you might borrow a transite and check the pins optically—and correct your calculations accordingly. Another way to discount weight deflection is to measure with the beam and frame supported vertically—if possible.

If there's much of this work to do, you can use a micrometer in place of the middle pin, or a two-ended dial indicator; or even a vernier scale, if high accuracy isn't required. A bridge-truss construction makes a good beam. A more accurate, and more expensive, rig can be made with accurate wheels in place of pins, using bubble levels to make sure you turn the beam over exactly 180° when reversing it.

Deflection because of gravity is the bugaboo with this device, but can be overcome in many ways—with strain gages in the beam, for example, or it can be calculated with strength-of-materials formulas. Once you have a beam, and know the deflection due to weight, it is a constant figure, and will not change unless you weigh down the beam with extra apparatus.

M P Blake, Rugby, England

Drill Bolt Circle Without Dividing Head

If you have to drill any number of holes around a circle, and are given the radius and chord distance between holes, here's one way to do it:

First, mount the work on a miller table. It's much easier if you can set it on a spindle or pin, around which the work can rotate—but this is not essential. It just means more work, otherwise.

Now indicate the center of the work under the spindle, move the table to the right by the exact amount of radius (using the feed-wheel dials), and drill the first hole. Next, do a bit of calculating:

$$\text{Cos } B = 1 - \frac{K^2}{2R^2}$$

(from Law of Cosines)

$$\alpha = 90 - \left(\frac{180 - B}{2}\right)$$

$$X = K \text{ Sin } \alpha$$

$$Y = K \text{ Cos } \alpha$$

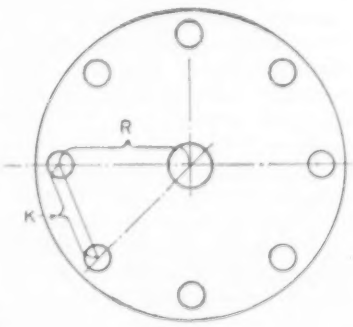
R is the radius, K the known chord distance, and X and Y are the coordinates of the second hole in relation to the first hole.

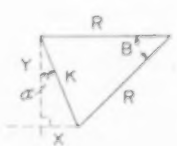
Move the table longitudinally by the amount X, and across by the amount Y. Drill the second hole.

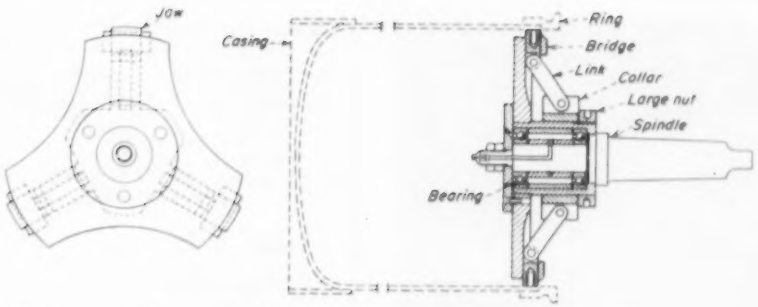
Now rotate the work so the second hole replaces the first—using a hinged pin or similar arrangement to locate it. Then drill again—and so on.

If the work can't be located on a pin, you'll have to relocate it after each drilling. When the second hole is done, insert a pin; then relocate the work center under the spindle. Use the pin in the second hole to indicate that hole against the work center to get them in line (centers, not edges), center the pin under the spindle, and so on.

Robert Moore, St Louis, Mo







Expanding Tailstock-Spider Chuck Grips Large Casings on Lathe

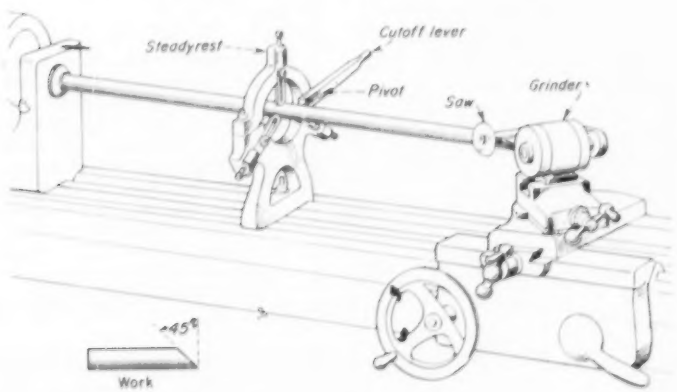
We make several sizes of large casings with contoured rings welded to the top; but the rings are turned after assembly. Thus, the whole assembly has to be mounted on a lathe. These are about 10 in. or more across, and 22 or more in. long, so the support method has to be strong, easy to rotate, and accurate.

The problem is solved with a three - joint expanding chuck mounted on a live tailstock center. We start with a set of bearings and collars, mount them inside a sleeve to fit the tailstock of the lathe, and weld on a triangular baseplate parallel to the ring that will be machined.

Next we add bridges at the three baseplate tips to admit clamping jaws that can be expanded inside the casings. These jaws are operated by links connected to a collar mounted over the sleeve. The back end of the sleeve is threaded, and a large nut fits over it behind the collar.

Thus, we can chuck the rounded end of the casing, and bring up the tailstock to fit inside the open end. By threading up the large nut, we expand the three jaws to center and grip the casing, insuring accurate and strong support. When mounted this way, the casing rings can easily be bored and faced off, as well as turned on the OD.

John A. Watson, Aldershot, England.



Lathe With Toolpost Grinder Makes 45° Elbow Parts

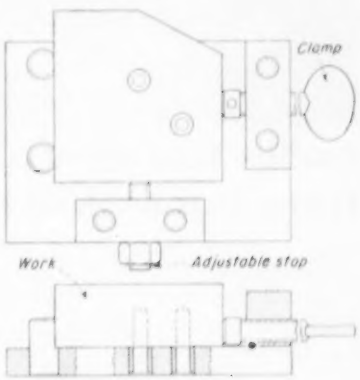
This setup saved us about 25% on material and plenty of time when we were cutting up pipe to make welded 45-degree elbows.

A toolpost grinder was mounted on the compound, which was angled at 45°. Instead of a grinding wheel, we installed a 1/32-in. slitting saw blade.

The work was supported by a steadyrest fairly close to the headstock. This was equipped with a lever-action cutoff tool—hand operated—to cut straight across the pipe.

After making one 45° cut, then the straight cut, stock was advanced to a stop on the cross-slide and another two cuts made. Thus, we got a complete piece after each cut.

John J O'Wril, Methuen, Mass



Low-Cost Jig

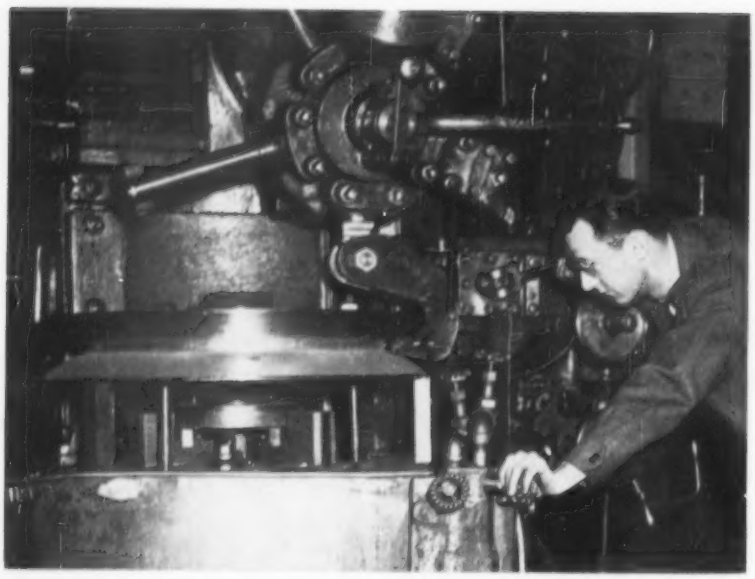
This drill jig uses a number of standard machine parts, and is easy to make. Start with a baseplate of about the size needed for the part, and scribe on it the part outline and location of holes.

Then drill holes for bushings. These must be accurate, but this operation is the only one that requires especially careful work. Then press in the bushings.

The stop-pin holes are next drilled so they interfere with the part outline about 1/16 in. The pins are then inserted. Next drill and assemble two blocks as illustrated, and add an adjustable stop (simple stud) and clamp screw. These are adjusted until they locate the edges of the work so the bushings line up properly under the work so they will spot the holes correctly.

Finally, file off flats on the stop pins until the work will slip into place. The jig is then ready to use.

George G. Herzl, Philadelphia



Radius Tool for VTL Turns Rather than Forms

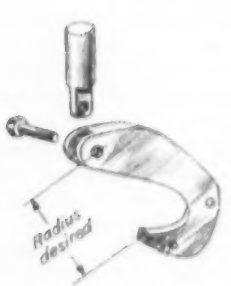
Small, square toolbits can be mounted in this tool for turning a radius on the under side of work chucked in a vertical lathe or boring machine. The tool is easily made for any radius, and costs a lot less than many other designs—especially form tools.

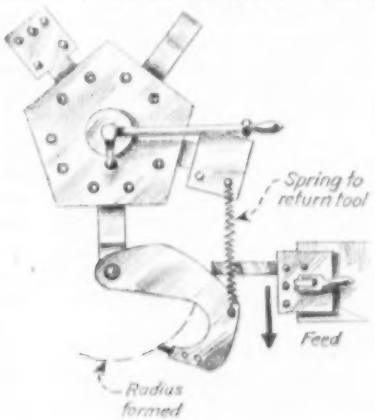
The toolholder is a curved arm, flame-cut to shape, depending on the size of radius wanted. It's slotted at the small end, and drilled and tapped for setscrews to hold the toolbit in place. The other end is slotted to take a tongued rod that fits in the machine turret.

A simple bar or rod clamped in the side toolpost can be arranged to feed the tool around the radius being cut. Here the curved shape of the holder comes in handy, because the bar pushes down on the holder, which makes the tool move in a circular path, hinged at the upper end.

To keep the tool from getting in the way except when being used, a spring is attached between the slotted arm and a block in the turret. The radius cut will be the distance between the tool tip and the center of the hinge. Clearance must be cut in the inside curve of the arm.

Phil McCafferty, Stanwood, Iowa





Winner No. 244

RICHARD MEYER
Paterson, NJ

won $25 in addition to regular payment for his idea:

BORING

ANGULAR HOLES

in the Issue of Jan 30 '56

An extra payment of $25 is made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

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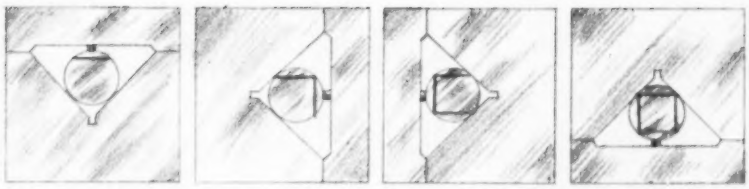
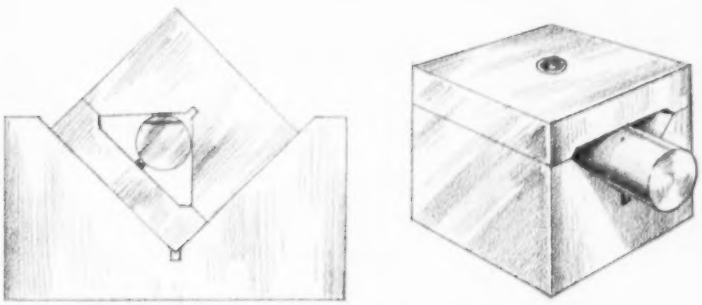




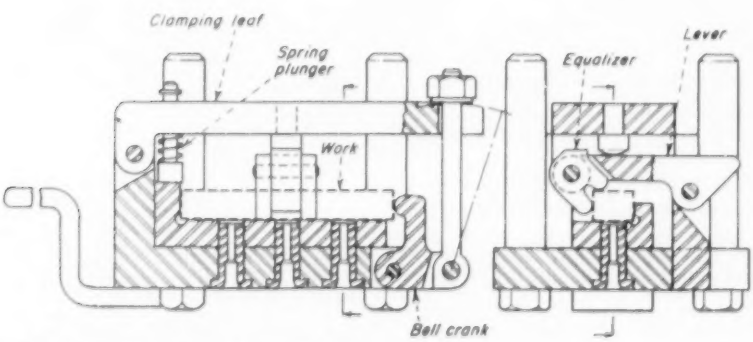
Another V-block—With a Cover

Machining and grinding troublesome small parts inspired the use of this special V-block with a cover in our shop. The cover allows making the block square so it can be indexed on its sides and top, and still remain at the same height.

Various clamping screws can be used, as long as their heads are recessed in the cover. Riser blocks can be added to increase the capacity of the block.

With another V-block, a setup can be worked out to index the work so eight flats can be milled on the work, or so eight equally spaced holes can be drilled.

Allan B Nixon, Springfield, Mass



Three-Way Jig Clamp Locates Parts Precisely

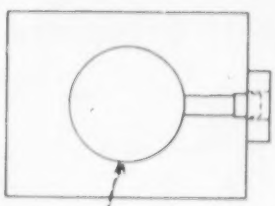
This jig can be made for any number of parts that must be drilled accurately. One case for which we used it was a military-rifle element.

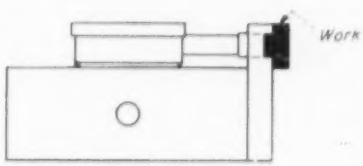
The clamp locates the part in three directions, but only requires one actual locking member. In the illustration it's a nut, but it may also be a quick-acting cam or thumbnut of some sort.

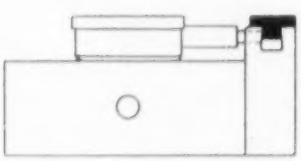
Work is clamped upside down, after which the jig is reversed and drilling proceeds. There are three swinging clamp arms, each one locating and gripping the work in a different direction. The spring plunger is most important, because it delays the clamping leaf enough to allow the bell crank to position the part against left-hand stop face. The equalizing lever, attached to another swinging arm, locates the work against the back stop face of the jig; and because of pressure from the clamping leaf above it, it also grips the part securely against the bushing plate.

Loading and unloading is easy—just flip the levers.

George F Oliver, Albany, NY





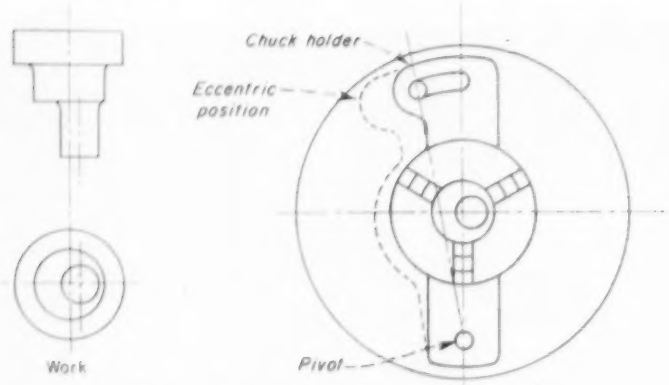


One Indicator Gages Two Dimensions

Length of hub and hub dia are checked with a single dial indicator and gage block as illustrated. The work is small parts, produced rapidly, so the gage is made so it can be set up quickly for measuring either dimension.

A steel block supports the indicator, and two plates are made to guide the work against the indicator spindle. Two different indicator tips are used, too. When setting up the inspection job, a master part is used.

Emery E Baxter, Chicago, Ill



Eccentric-Turning Fixture Shifts on Faceplate

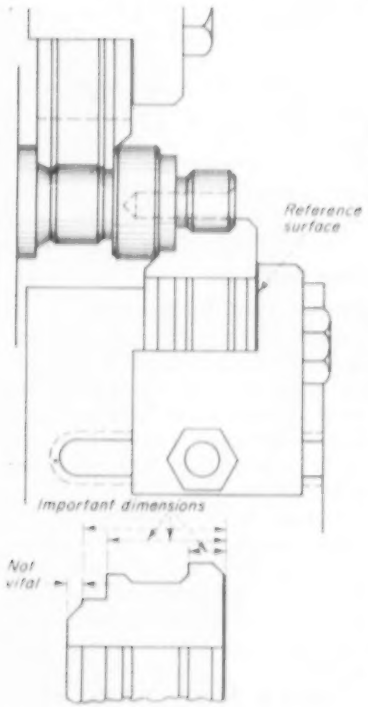
We had to produce large batches of steel castings with three diameters; two on center, and one eccentric. The largest one remained as cast, while the smallest two had to be turned.

Setup was made on a lathe faceplate, where we mounted a cold-rolled-steel plate that supported a three-jaw chuck. One end of the plate was held by a pivot bolt; the other by a second bolt through a slot in the plate.

After turning the middle dia on center, we shifted the plate over to center the eccentric dia, and then turned that one.

To make shifting easy, we machined the curved slot so it was stopped at one end with the work on center, and at the other end with the eccentric dia on center. Thus, no measuring was required after setup.

Federico Strasser, Santiago, Chile



Tool Changing The Easy Way

It's customary to read from left to right, and usually to work that way, too. But this causes a lot of trouble sometimes when you're working with form tools — both circular and flat.

Often toolholders have flat reference surfaces on the right. If the tool is designed with its reference surface at the left, you've made the holder's reference surface useless, because the operator must adjust the toolholder in its T-slot by loosening the T-stud.

However, if the tool's reference line is at right, the only necessary adjustments can be made with the tool bolt.

Therefore, make all dimensions read from the right—the reference surface. When tools are changed for regrinding, the new tool can be slipped into position and no jockeying is required.

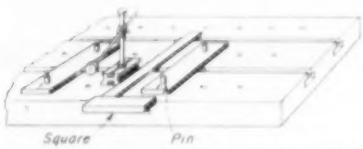
Fred Buehler, E Rochester, N Y

Resettable Parallels Locate Multiple Planer Work

A set of six short parallel bars was made to set up multiple pieces on the planer table. These were made accurately so they can be set up again at any time without going through a lot of checking to make sure they really *are* parallel.

We locate them by means of stop-pin holes on the planer table. First we cut the bars, then jig-bored two holes in each—separated by distance between stop-pin holes. Next we assembled the bar on the table with pins.

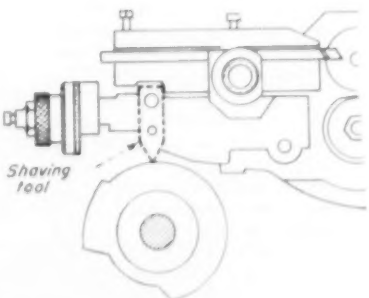
To check them, we used a square, surface gage, and dial indicator. Where necessary, we measured and



removed the parallels, and milled and ground them to dimension.

In the future, we have a set of parallels all ready for multiple setups.

R J Shields, Agawam, Mass



Simple Tool Adjusts Automatic Cam

When it is necessary to shave or correct the cam that controls the No 1 or No 2 tool on a Swiss-type automatic screw machine, there's a short-cut that may be helpful.

The cam follower can easily be replaced by a small shaving tool. This can be adjusted with the micrometer adjustments on the tools. Thus, the whole machine does not not have to be dismantled.

W Timmons, Dundee, Scotland

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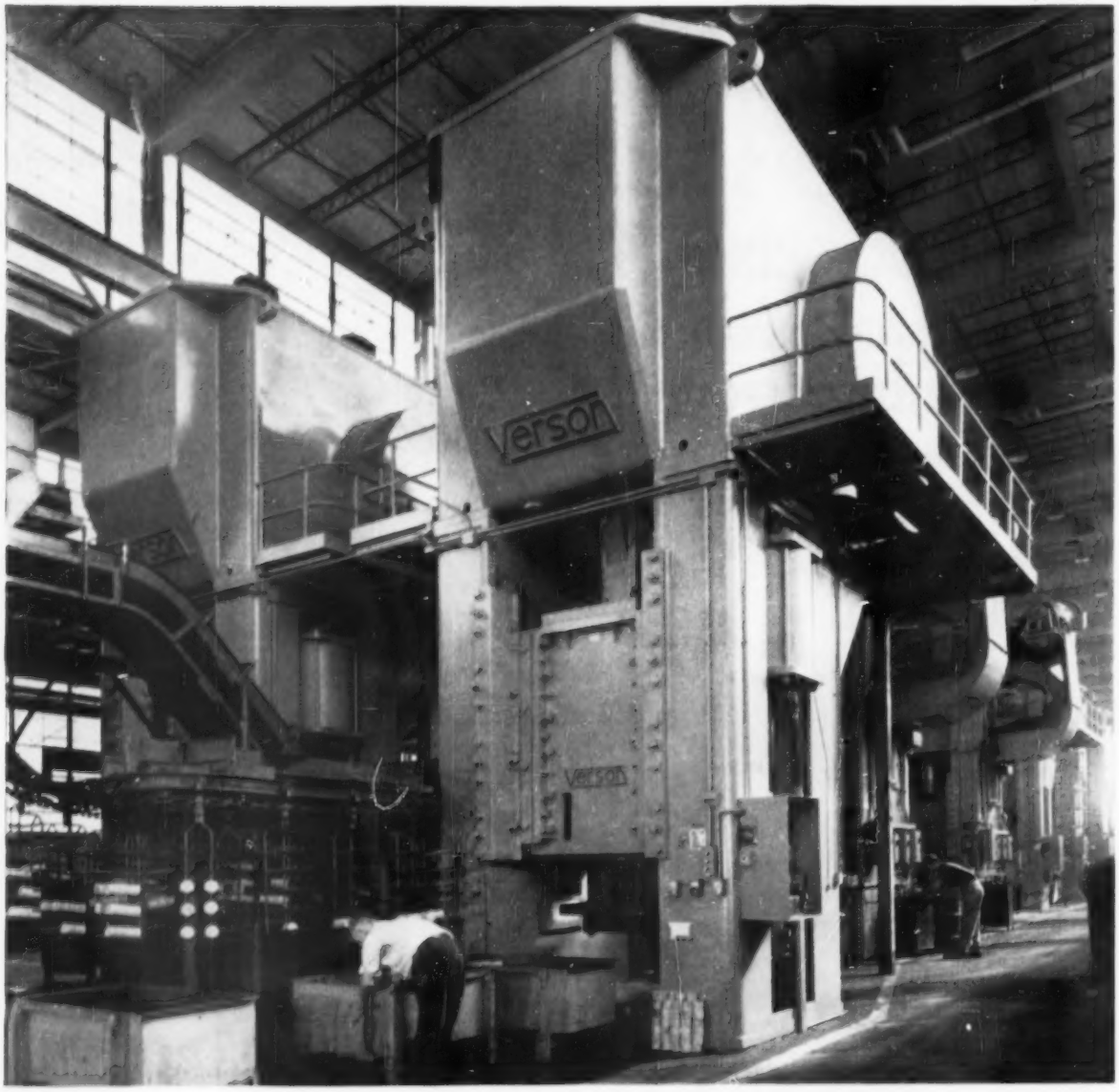

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American Machinist REFERENCE BOOK SHEET

DRAFTING PRACTICE FOR FORGINGS . . . I

Source: Tentative American Standard entitled "American Drafting Standard Manual—Section 9: Forgings" to be published by the American Society of Mechanical Engineers

A forging is a metal part shaped to its desired form by means of hammering or pressing. Forging is normally hot forging, with the metal heated to some elevated temperature. Forging is also done without heating the material and this is known as cold forging.

PROPERTIES OF FORGINGS

(a) The working of metal under pressure, as in forging, produces a homogeneous part that is free from porosity, seams and blowholes.

(b) Forging compacts the fibrous structure to its maximum unit strength.

(c) Steel forgings may be welded together to form a more complex part and still retain their superior strength.

(d) Bending may be used in addition to forging to produce parts too irregular for forging alone.

(e) The working of steel from the ingot to the forging stock produces a fibrous structure having greater dynamic strength parallel to the fibers.

Limitations:

(a) Parts having complex interior spaces and those having large, unsupported areas of thin cross-section do not lend themselves readily to forging.

(b) Complicated shapes usually require costly dies. Die cost may be reduced at the expense of extra machining. This may reduce the total cost, especially for small-lot production.

Materials:

(a) *Steel.* Carbon steel in its full range of carbon content is used for forgings. The grade required will depend upon the final use of the forging. Steels of the higher carbon range usually require heat treatment to produce their full strength.

The various alloy steels are used for those forgings that must have high strength to meet severe service conditions.

Forgings to be used at high temperatures or under corrosive conditions are made from heat resistant or stainless steel.

(b) *Copper, Brass and Bronze.* Copper forgings are used extensively in the electrical industry. The various forging grades of brass and bronze are used for forgings that must resist corrosion.

(c) *Aluminum and Magnesium.* There are forging alloys of both materials. These materials are used extensively for forgings where a combination of strength and lightness is required.

(d) *Titanium.* Titanium is used for high-strength, light-weight forgings.

Definitions

Closed-Die Forgings. These are also known as drop forgings and are made in dies containing impressions that produce a forging of the size and shape of the impressions. This standard is mainly concerned with this type of forging.

Open-Die Forging. This type of forging, also known as a hand forging, is made between flat dies, and is manipulated during the forging process to produce the desired shape and dimensions.

PRODUCTION METHODS

Board Drop Hammer. The board drop hammer is a gravity drop hammer having a board attached to the upper part of the moving ram to enable it to be lifted preparatory to dropping. The ram slides between two side frames that are connected to either side of the anvil on the bottom and to the elevating head at the top. The board is squeezed between a pair of rotating rolls in the head to raise the ram. At the upper end of the stroke, the rolls open and a pair of clamps automatically close to prevent the board and ram from dropping. Spreading the clamps by means of a treadle allows the ram to fall for the forging blow. When the treadle is held down, the clamps spread automatically at the top of the stroke, allowing continuous operation.

This hammer is used for the lighter class of forgings.

Piston-Lift, Gravity-Drop Hammer. This hammer is essentially the same as the board drop. A steam or air cylinder is used for raising the ram instead of the board and drive rolls. Gravity produces the forging blow.

Steam Drop Hammer. A double-acting steam cylinder is used in this type, both to raise the hammer ram and to add to the force of the forging blow.

Impacter. This is a type of hammer consisting of two die holders (impellers) of equal mass, operating horizontally, which are driven together by compressed air so they will repeatedly strike in the same plane of impact. The machine may be fitted with flat dies or impression dies. It can be fitted with electrical controls permitting its integration in an automatic forging process, which combines feeding, heating, forging and trimming; or it can be equipped with manual controls for drawing, swaging, upsetting, and other "flat-die" hammer operations. It differs from conventional hammers in that it forges without shock or vibration and requires no special foundation, in contrast with the various hammers.

Hydraulic Forging Press. The hydraulic forging press has a heavy base or anvil that supports the lower die. A high-pressure cylinder is supported above and connected to the base by means of two or more heavy vertical tierods. The upper die is fastened to the bottom of the cylinder ram which exerts a downward force on the forging. Hydraulic presses are used for the larger open-die forgings and to a great extent for closed-die forgings of aluminum and magnesium where the slower action of the press produces a better forging.

Mechanical Forging Press. The mechanical forging press is an extremely rigid, high-speed, vertical, straight-side, single-action press with a double-column frame. Energy is supplied by a continuously operating flywheel and is transmitted to the eccentric shaft by a high-capacity, air-operated friction clutch. A spring-set, air-released friction brake stops the crank rotation after each revolution. A rigid, double-wedge die seat permits adjustment

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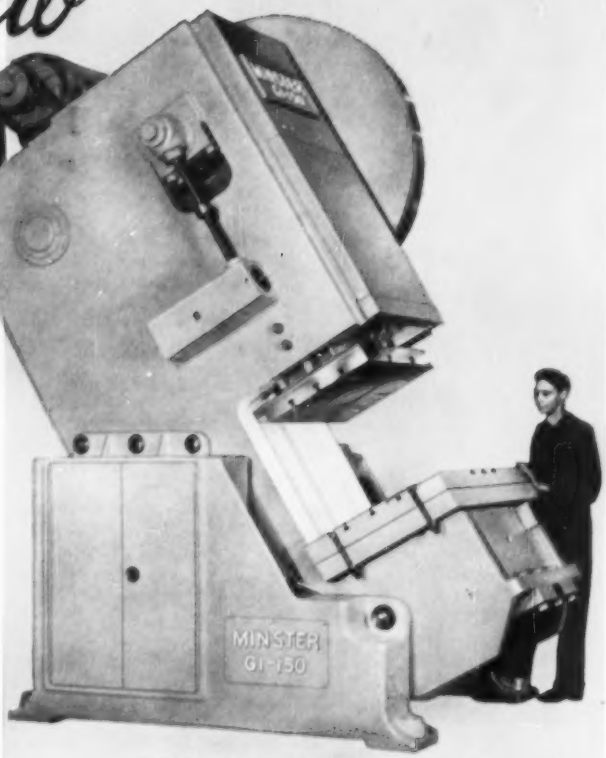

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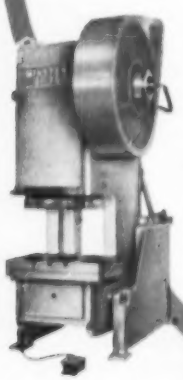

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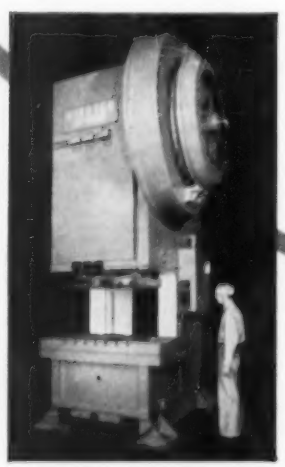

The 200 ton G1 fixed base geared type gap press—Available with either bed attached or sliding type die cushion.

CONDENSED STANDARD SPECIFICATIONS

CAPACITY	STD. STROKE of slide	STROKES per minute	BED AREA	SLIDE AREA
75 tons	4	Flywheel 90 or 120 Geared 40	24 x 36	18 x 24
110 tons	5	Flywheel 80 or 105 Geared 37	27 x 42	21 x 28
150 tons	6	Flywheel 80 or 105 Geared 30	30 x 50	24 x 34
200 tons	8	Geared 28	34 x 58	28 x 36

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DRAFTING PRACTICE FOR FORGINGS . . . II

of shut height. Mechanically operated upper and lower knock-outs eject the forging from the die cavity. Small, inserted-type dies are held in guided bolsters capable of holding a range of die sizes. Most press forgings, which are produced in closed dies, are made in only two or three blows.

Mechanical presses are used for small- and medium-size forgings.

Horizontal Forging Machine or Upsetter. The horizontal forging machine has a heavy frame and the same type of driving mechanism as the mechanical forging press. In the forging cycle, the blank is held within grip dies while the header die advances to cause the metal to take the desired shape. One of the two grip dies is stationary while the other is movable to permit insertion and removal of the forging.

The horizontal forging machine is especially adapted to forging operations that are performed on the end of a bar, such as upsetting, heading and piercing.

Reducing Rolls. This stop-motion machine has a pair of roll dies driven by means of a constantly running flywheel through an air-operated friction clutch. The roll dies may have from one to four grooves, depending on the amount of reduction necessary. The stock is passed through the rolls once for each forming operation, the rolls making one revolution for each pass. Principal use of this machine is in the preparation of forging blanks.

Trimming Press. These are either hydraulic or mechanical presses and are used for removing the flash from the finished forging.

HAMMER AND PRESS FORGING OPERATIONS

Forging is the operation of moving metal from a location in a bar to a new position in the finished forging. This will usually require several steps depending upon the complexity of the forging.

Fullering. Forgings having sections smaller than the original bar require a fullering operation to reduce the diameter.

Bending. Irregular forgings may require a bending operation to position the metal for the next die impression.

Edging. Edging is the distribution of the metal to its proper position to insure complete filling of the die cavity.

Blocking. This is the flattening and rough forming operation.

Rolling. The reducing rolls may be used for any of the previous operations except bending.

Finishing. The finishing operation will require one or two die impressions to bring the forging to its final form.

Trimming. The excess material in the die is forced out between the dies and forms flash, a thin web extending around the forging. It is removed by forcing the forging through a trimming die, usually in a trimming press.

FORGING MACHINE OPERATIONS

Horizontal forging machines are used for upsetting, deep piercing and hollow forging operations, usually on the end of bar stock.

Upsetting. This is the increase in diameter produced by the header tool forcing the forging stock into the die cavity. The upset usually occurs at the end of the bar, but the use of sliding sections in the gripper dies permit sections of the bar to be upset within the dies.

Piercing. Holes and recesses having a depth of up to approximately seven diameters may be pierced by means of progressive die sets.

Hollow Forging. Rings and hollow forgings are made in a set of dies that use stock smaller than the finished piece. After upsetting, the hole is punched, separating the forging from the bar without waste.

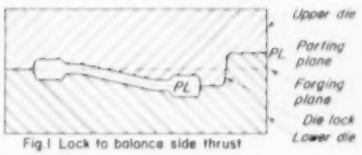

Fig. 1 Lock to balance side thrust

Fig. 2 Balanced side thrust

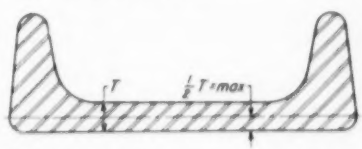

Fig. 3

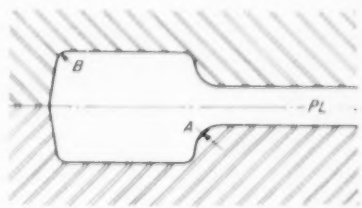

Fig. 4

table 1 . . FILLET RADII

H	¼	½	1	2	3	4	5	6
R_1	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$
R_2	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	1	$1\frac{3}{8}$	$1\frac{3}{4}$	2

table 2 . . CORNER RADII

H	¼	½	1	2	3	4	5	6	7
R_1	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{1}{2}$
R_2	$\frac{1}{16}$	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{11}{16}$
R_3	$\frac{3}{16}$	$\frac{3}{16}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{8}$	$1\frac{1}{4}$	$1\frac{1}{2}$

table 3 . . WEB THICKNESS

Area Sq in.	4	20	80	200	400	600	800	1000
Thickness	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{7}{8}$	1

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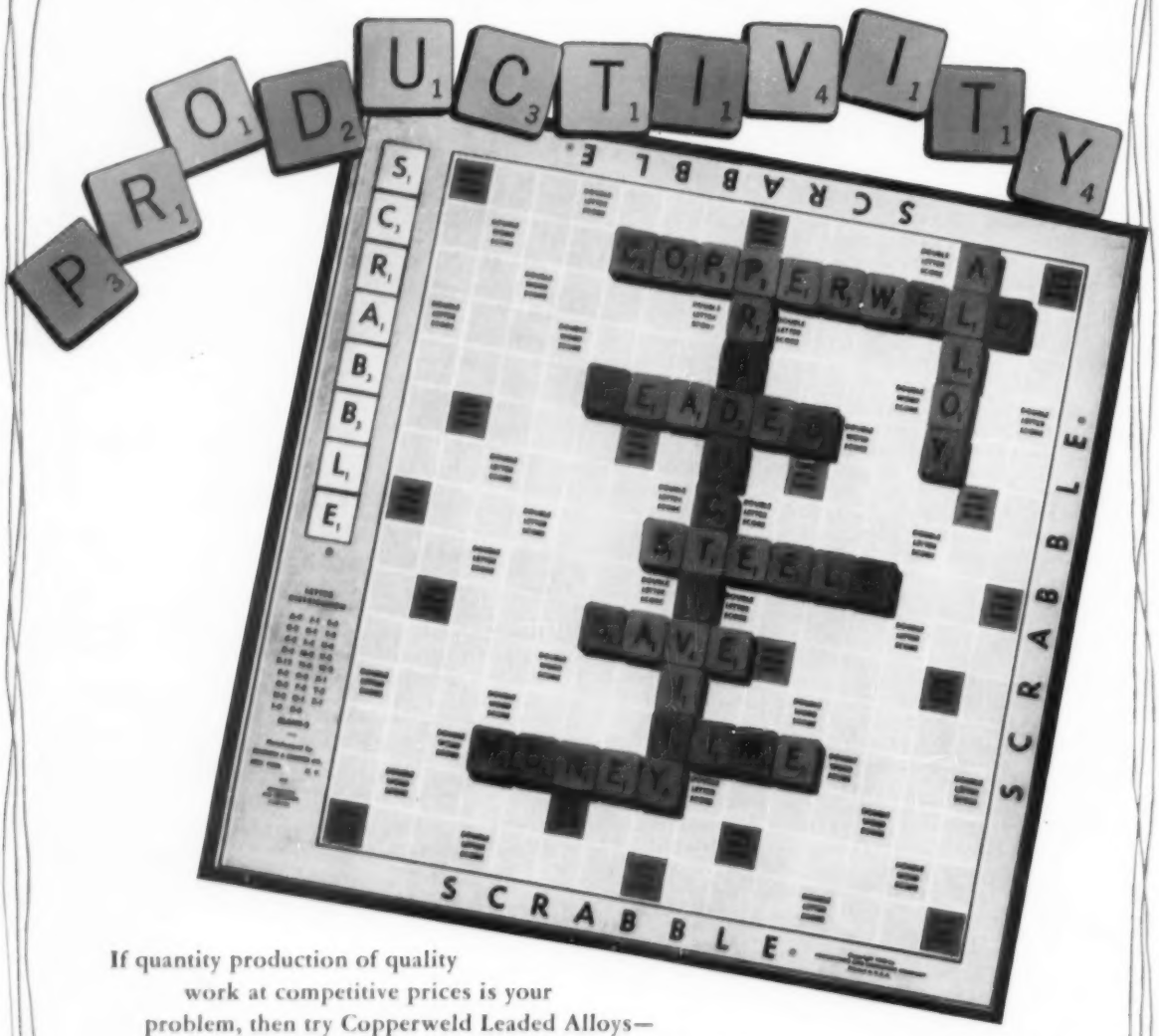

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DRAFTING PRACTICE FOR FORGINGS . . . III

Shearing. The finished forging may be sheared from the bar by a cutter in the moving gripper die.

Trimming. A trimming die can sometimes be built into the dieset so that the last operation produces a trimmed forging.

FORGING DESIGN

Parting Plane. The parting plane is the plane of separation between the upper and lower dies. The location of this plane is usually the first step in the design of a forging. Generally this will follow the center line as shown in Figs. 1 and 2. Fig. 3 shows the parting plane location for channel-type forgings. The parting plane should pass through the largest cross-section of the forging. This will reduce the impression depth and also reduce the work required in forging.

Forging Plane. The forging plane is a plane perpendicular to the direction of the upper die travel. This should be shown when it does not coincide with the parting plane as shown in Figs. 1 and 2.

Draft. In general, closed-die forgings must have draft or taper so that the forging may be removed from the die. All draft angles are measured from the forging plane.

Draft Angles:

Hammer. The standard draft angle for outside surfaces of a forging is 7° for all materials. Inside angles are usually 7° for aluminum and magnesium, but steel forgings usually require a 10° angle. In some instances these draft angles may be smaller.

Press. The above draft angles are also used for presses, but where means for positive ejection of the forging from the die are provided, smaller angles may be used.

Horizontal Forging Machine. Piercing punches have no draft angle. In general, gripper dies require no draft angle unless the forging has more than one flange, where a 5° draft must be provided.

Fillets and Corners. The size of the radii used for fillets and corners has considerable effect upon both the quality of the forging and die life. As shown in Fig. 4, a small radius at *A* will restrict metal flow. This will increase die wear and tend to produce seams or improperly filled sections in the forging. When the radius at *B* is too small, the forging pressure concentrates at this point and causes die cracks which reduce die life. These sharp corners in the impression are also difficult to fill properly.

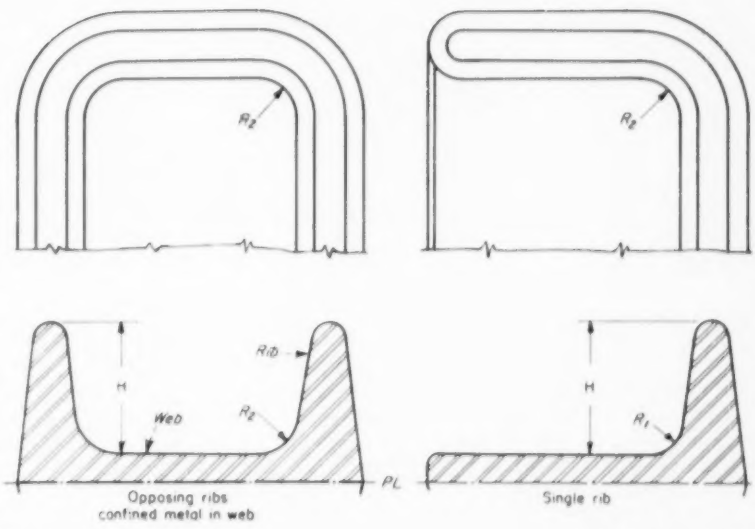
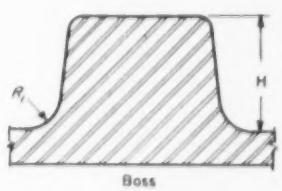


Fig. 5



Fillet Radii. Fig. 5 shows the minimum radii to be used in the design of forgings. The use of larger radii than those shown in the Table 1 will both increase the die life and improve the forging.

Corner Radii. The minimum corner radii to be used are shown in Fig. 6 and Table 2.

Web Thickness. The minimum web thickness is dependent upon the area of the forging at the parting plane and the height of any ribs on the forging. High ribs and a thin web tend to make the forging more difficult to produce. When this combination occurs, the rib should be widened to assist the flow of metal. Table 3 gives the minimum thickness to be used for webs.

Ribs. The thickness of ribs will vary with their height, the thickness increasing with height. The minimum thickness shall be determined by *R*, in Fig. 6.

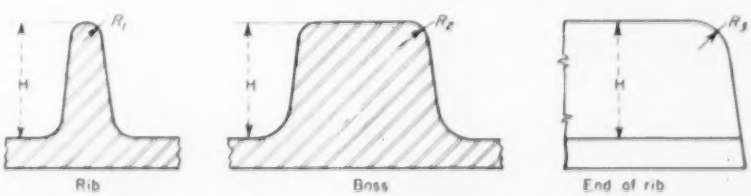


Fig. 6

To be continued in an early number

Outstanding savings at the spindle! That's what the exclusive Extended Spindle Face assures you — on every Brown & Sharpe Universal and Plain Milling Machine. Here's how this unique design feature cuts milling costs:

SUPER SAVINGS AT THE SPINDLE!

with exclusive Extended Spindle Face design

First; it provides extra rigidity that permits use of shorter and smaller diameter arbors and smaller cutters — saves on tool cost. Second; use of smaller cutters permits faster feeds and shorter run-in for any surface finish — saves time. Third; shorter distance between spindle nose and cutter minimizes vibration — saves cutters. Fourth; convenient table location and extra work clearance save work motions — reduce operator fatigue. And these are only the savings at the spindle! In addition, Brown & Sharpe Milling Machines offer many other original design features such as independent motors for spindle, knee, and pump — features that step-up efficiency of your operations. For details, write Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

Ask About Our Pay-as-You-Depreciate Machine Tool Plan

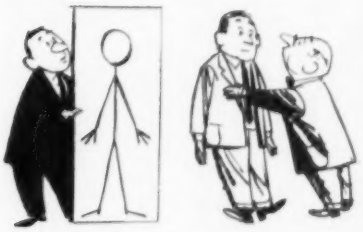
Saves money

Saves time

Saves cutters

Saves work motions

Talking Shop . . .



Cherchez le Homme

CHEMICAL WEEK, Jan 21, p37, tells about a new chemical plant costing $15-million that was nearly complete, ready for installation of final equipment, when company officers realized they had forgotten to hire someone to manage the new operation. In their excitement over new gadgets and new processes, the operating organization had been ignored.

Their faces were red and so were the plant's operating statements until the right man was found for the job. The story is almost unbelievable, but it is true. It could happen in the most uptodate industries.

Reminds us of a story, also true, that happened a few years ago. One of our editors talked with two men who were buying machine tools at an auction. One of the men was general manager and chief engineer of a company in the process of setting up a large branch plant which he was to run. The other man was his accountant. Both men were very capable in their fields, but neither had any manufacturing experience in the shop. They were spending $150,000.

Our man asked, "Where is your works manager or general foreman?" The answer, "Oh, we haven't found the right man yet. We'll buy the machines now and hire a foreman when we get 'em into the plant. These lists are prepared from the operation sheets for the parts we will be making."

We still feel sorry for the foreman who was expected to work with some of the clunkers bought by these "experts" that day.

Cased Ti

A HARD, wear-resistant, anti-galling surface can be produced on titanium by heat treating in a nitrogen or nitrogen-oxygen atmosphere. Case depths 0.003 to 0.010 in. thick can be achieved, with surface hardness over 1000 Vhn. Armour Research Foundation studied the problem.

Nail Polish

ENGINEERS at Thompson Products, Cleveland, had a problem—tiny belts on a polisher broke 50 to 60 times a day. The operator, Mrs Emmie Gabor, came up with the answer. She recalled stopping stocking runs with nail polish, and noticed that belts always frayed at the edges before they broke. So she put nail polish on the belt edges. Savings the first year were $50,000, so Mrs Gabor got a suggestion award of $6562—highest ever paid at Thompson.

WE Training

WESTERN ELECTRIC (Indianapolis) has a 7320-hr tool and die course, of which 6420 hr are in the shop, 900 in classes. Shop work covers operation of machine tools, repair and building of jigs, fixtures, gages, and dies. Classroom time is spent on machine and bench assignment theory, plus math, metallurgy and mechanical drawing.

Taller and Thinner

BLAW-KNOX reports that major increases in height of TV towers can be achieved with the new T-1 alloy steel made by US Steel Corp. It has saved 30% in weight on the new tower at Nashville, Tenn, for WSM-TV, third tallest in the world at 1379 ft (tallest to date is 1600 ft).

Conveyor Stopper

ONE NEAT IDEA in General Electric's paint line at Pittsfield doesn't show on our cover for this issue. After the conveyor has carried painted tanks through the drying oven (which is shown), it takes them through a 15-ft tunnel where cool-air blasts bring the work down to handling temperature. At the exit end of the tunnel, tanks are removed by crane from the conveyor. But if any tank is not removed before the conveyor end, it breaks a beam of light that actuates a photo cell to stop the conveyor. At the same time, a light comes on to alert the crane operator to remove the tank. Because the light beam is only inches above conveyor slats, even a tank cover will trip the safety device.

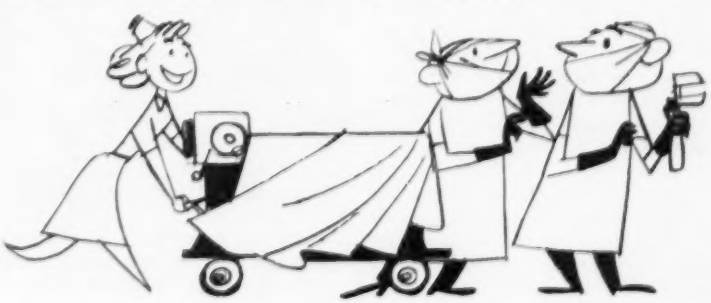
Metal Fuel

ARGONNE NATIONAL LABORATORY is investigating a new kind of fuel—a suspension of uranium compounds in liquid metals to make a uranium or plutonium slurry for use in power reactors. Uranium dioxide treated with hydrogen at 500 C can be readily suspended in liquid sodium-potassium alloy at room temperature to 10% concentration and does not settle out.

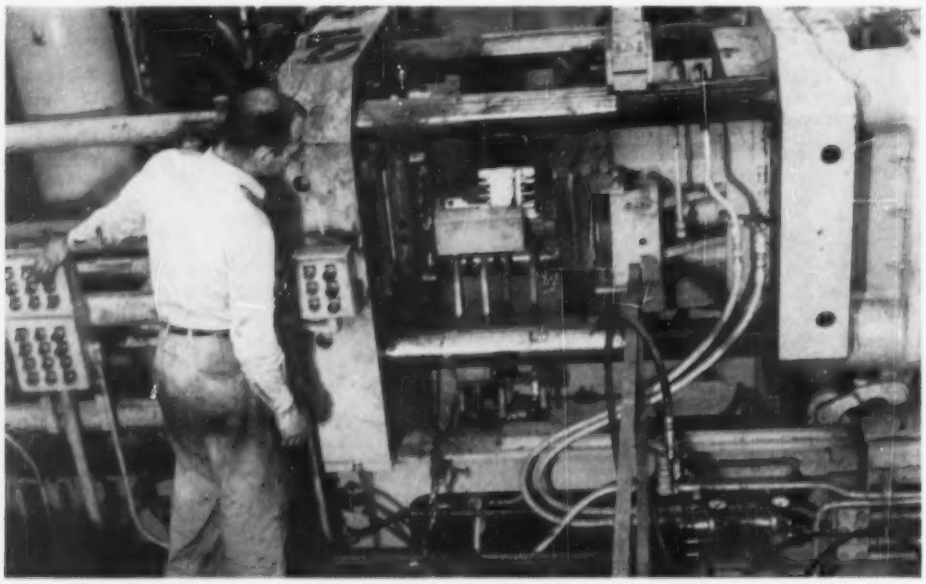
Tooling Hospital

METHODS ENGINEERING at Watervliet (NY) Arsenal is using a smart system for expediting new tooling. When a new setup is planned, engineers go into the shop and select a machine capable of doing the job. Then the entire machine is picked up and moved into the Methods toolroom by truck. (This is a separate shop devoted entirely to methods development and tooling.) The machine is tooled as necessary, test runs are made until production is satisfactory, and the machine is returned to the shop. It may go to the original location or to a new place in the line. If the machine is too large to make this procedure practical, as much as possible of the tooling is completed in the toolroom and tests are done in the production area.

By using this system, engineers feel that there is minimum disturbance to other production personnel, the machine is not seen in the shop until it is working satisfactorily, and both study and tooling are accomplished with a minimum of running back and forth by the Methods people.



News of Metalworking . . .



PRESSURE DIE CASTING OF ALUMINUM-ALLOY ROTOR CORES is done at 1000 F. Air pockets are thus avoided, and internal fan fins are cast integral. Rotor (the white object, center) is visible here as molds open

Here's GE's Fabulous Building 85, Shown

SCHENECTADY — "Hush - hush" Building 85, housing General Electric's completely new 7½- to 30-hp electric-motor plant, has just been unveiled — meaning shown to its stockholders and (at long last) the technical press. Probably the world's most-modern factory, it replaced a line at Lynn, Mass, about 1½ years ago, and doubled capacity at the same time by incorporating latest ideas in fabrication and assembly. Cost was about $7 million. One machine setup has been described (*AM* Dec 20 '54, p110-112) without identification, and the plant was shown to 2000 employee families and their wives a year ago Mar 19 (*AM*—Apr 11 '55, p170).

Operated by the Medium Induction Motor Dept, Building 85 is actually three plants under one roof, making possible 3-shift production in the Tri-Clad 55 line, permitting output in a 24-hr cycle of the motor that formerly took two weeks. Only two major hand operations are involved (all the others are automatic), and there are three parallel straight assembly lines, two outer ones handling standard motors, while the middle one makes specials—drawing standard components from the other two.

The plant, according to O F Vea, general manager of the Department, was designed about 3½ year ago to meet a market expected to increase at least 75% by 1965. It employs more personnel than ever before because of increased output.

Glenn A Cook, manager of operations, explains that principal hand operations still in use on the two standard lines involve stator winding and a portion of final motor assembly. All other operations are performed on progressive machines.

Flexible Design

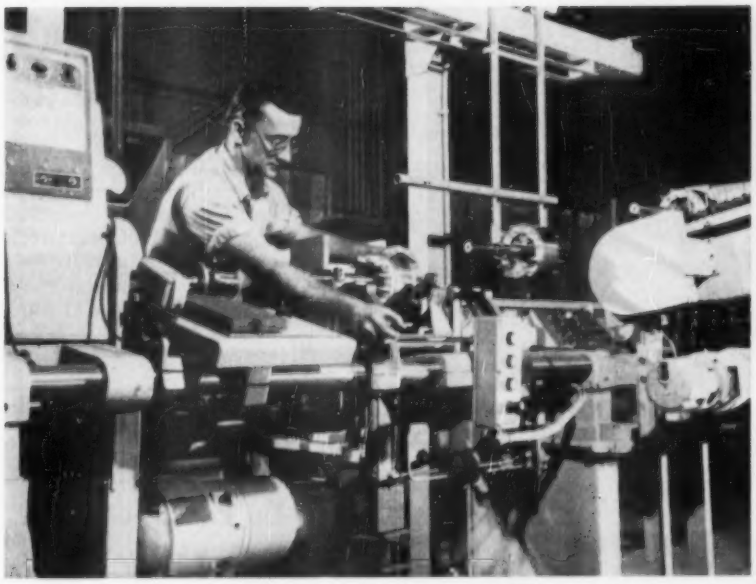
Designed from a "building-block" approach, the first production line was installed early in 1955 for the 250 frame size. By August, 1955, the factory had attained quantity production of all three of its Tri-Clad frame sizes in 7½ to 30 hp to the new NEMA specifications. The factory produces more than 100 standard models, plus a wide variety of special motors.

Motor parts progress towards final assembly and testing along roller-type conveyors, with an overhead suspension system as needed for handling of materials and such operations as moving wound stators through automatic dip - and - bake processing.

Flexibility has been enhanced by placing all machines except the largest punch presses on movable mounts. A feature is an array of automatically operated punch presses at the beginning of both production lines. Punching operations are fully automatic, including feed, movement of punchings from blanking to indexing presses via magnetized conveyor belts, and removal of metal waste.

Metal scrap from punchings is collected under the floor in an automatic operation conveying it to a chute which shakes scrap on cycle into a large bucket. The cycle is concluded as the bucket fills to a preset load, when it automatically lifts to dump scrap utside.

All machining operations on 250-size frames are performed at a single machine where feet are milled, foot-holes and conduit-box holes drilled, shaft hole bored and rough-finished, and holes bored and tapped for the endshield bolts—all in a progressive



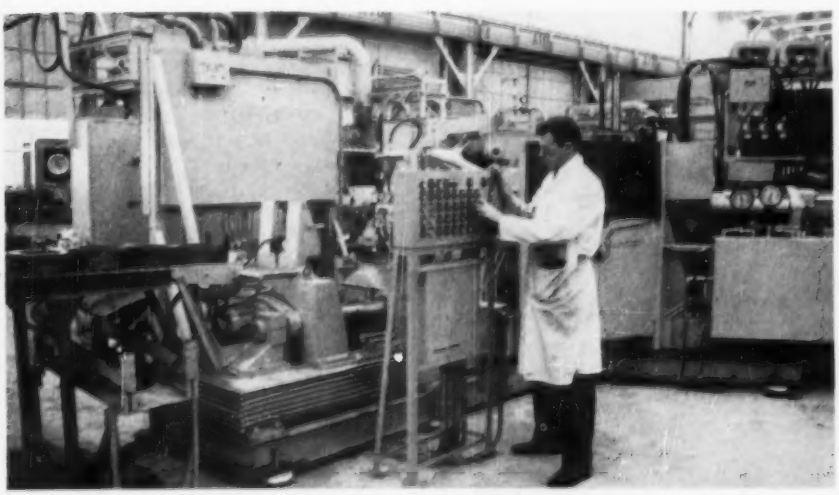
THIS AUTOMATIC LATHE IS NEXT TO A BALANCER and connected to it by semi-automatic conveyor. It uses 2-in.-dia rotary tools, is actuated by operator placing newly assembled rotor core and shaft on rails (See *AM*—Dec 20 '54, p110)

BLANKING PUNCH IS FULLY AUTOMATIC. Stator segments from blank go out on upper conveyor, rotor on lower; both normally covered by floorboards here removed for visibility

at Last

series of automatically controlled operations. Each was previously a separate operation at a different machine.

In another fully automatic operation, wound stators are passed through three ovens in a dip-and-bake processing on a preset cycle of about 6 hr. They are progressively preheated, dipped into varnish, baked, given paint dip, baked again and finally given silicone dip. Hand operations demonstrate the great emphasis placed on quality control. A previous production-line test for turn-to-turn failure, unbalanced resistance and high voltage is given at the point where the wound stators are prepared for the dip-and-bake processing. At regular intervals, fully assembled motors are selected for additional testing. Along both standard lines and the special line all operators check their own work as it progresses toward final assembly. "Floating inspectors" also check the work at various stations.

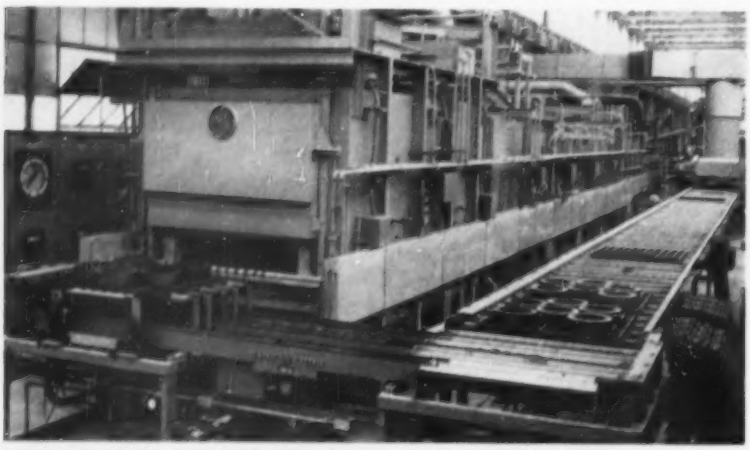


STATOR CORES ARE WELDED AUTOMATICALLY, under control from this panel. Welding provides greater strength, better alignment, and improved magnetic qualities to the core

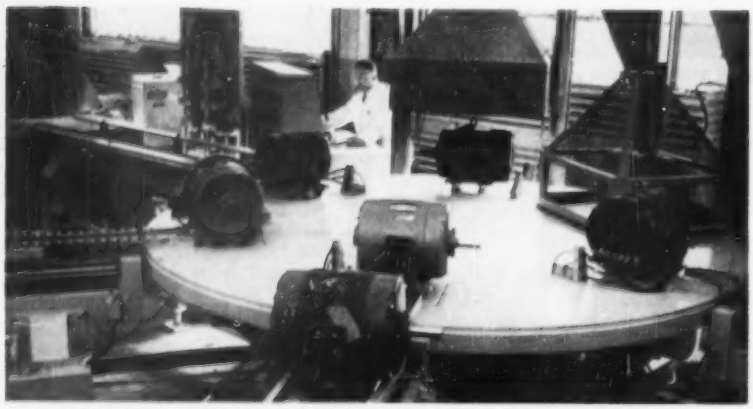
"Serve-Yourself" Storage

As they leave the final test platform (see picture), motors are crated and raised by an automatic lift into a giant, slotted storage bank similar in principle to the self-filling slots in some food markets.

Accommodating more than 1000 boxed motors at one time, the bank receives the motors at one end—placed into slots according to size



HUNDREDS OF POUNDS OF ROTOR AND STATOR PUNCHINGS are annealed each hour in a single straight pass through this furnace. Work is carried on grids over a roller conveyor



ALL MOTORS RECEIVE RUNNING, SOUND, AND ELECTRICAL characteristics tests automatically on rotating tables at the end of each standard production line. Platform handles six motors at once on a 3-min cycle, testing for vibration, noise, electrical resistance, and high-voltage reaction

PERFORMANCE TESTS OF MOTORS are made on this dynamometer, being measured for speed and torque characteristics under load

and model—and by means of sloped roller conveyors allows each box to move forward as boxes ahead are removed.

Mr Cook said the new factory has made possible both an improvement in quality of the finished motor, primarily through an improved uniformity in manufacture, and faster service through heightened flexibility. On the normal production schedule, each of the more than 100 standard models is manufactured every two weeks. But the high degree of flexibility in the new layout permits change of schedule at any time to meet a particular market demand.

U of Cincinnati Celebrates 50 Years Of Co-Op Education

CINCINNATI—University of Cincinnati's celebration of the golden anniversary of cooperative education here April 19-25 was highlighted by the arrival here of the National Association of Manufacturers' Americade—a quarter-million-dollar traveling exposition that dramatizes 50 years of industrial and technological progress.

Not an industrial show—and not designed to promote any products—Americade's purpose is "to translate blueprints . . . and other predictions of the great promise of the future into a vibrant, dramatic story." Two features at the week-long showing: closed-circuit TV that lets the viewer look at himself on the screen, and a simulated space ship whose controls can be worked by the visitor.

The University's seven-day celebration also included awarding of honorary degrees to prominent businessmen and educators, including Frederick V Geier, president Cincinnati Milling Machine Co; Charles R Hook, board chairman Armco Corp; and Dr Frederick L Hovde, president of Purdue University.

Mr Geier is chairman of Cincinnati University's National Sponsoring Committee for the anniversary, and Mr Hook is a committee member.

Honored too, of course, was Cincinnati's late Dean Herman Schneider, who conceived the cooperative education plan some 50 years ago in which students alternately attend classes for seven weeks then apply their knowledge in industry.

Automation Must Bolster Manpower To Meet U S Needs

BUFFALO, N Y—The U S labor force will be unable to cope with the nation's fast-growing need for goods and services in the coming years unless automation and mechanization of industry is accelerated. That's the opinion of Louis Polk, president, National Machine Tool Builders' Association, given in an address at the 20th Annual Westinghouse Machine Tool Electrification Forum here at the Statler April 17.

Based on 25-Year Trends

Mr Polk based his opinion on an index that shows trends of total employment, physical volume of industrial production and electrical output for the last 25 years, and projects these trends 25 years into the future.

Said Mr Polk: "Only part of the employable people in the country are available for industrial production . . . in 1950, the last census year, manufacturing accounted for only about one quarter of the total. If that ratio still holds good in 1980, it would mean that industry would have only about 22,400,000 people available to turn out the incredible production total indicated by the projection of the Federal Reserve Board Index.

"If, by 1980, we are going to reach the volume which this projection indicates, we'll have to get busy right now finding still more ways and means by which the individual worker can turn out more work per hour. Only by accelerating the factor of productivity can we possibly keep pace with future demand.

Mass Unemployment? No!

"Not so many months ago, there was talk in some quarters that the new and better machines were going to put men out of work. That idea already seems ridiculous. The fact is that without new and better machines, the labor supply of the country won't be anywhere near big enough to turn out all of the things that the people will want and be able to afford.

"The people who start planning today for the maximum mechanization required tomorrow will stay out front in the productivity race," Mr Polk concluded.

Navy Looks into Replacement

WASHINGTON—If the Navy would spend $14.3 million for 823 modern machine tools to replace 1218 obsolete machines in 11 shipyards and the Navy repair facility at San Diego, Calif, it would make annual savings of 457.1 man years and of 23,607 sq ft of floor space and would amortize its investment in less than nine years on a peacetime, one-shift operation of 2000 workhours a year.

A J Weisbecker, head of the Industrial Tool and Equipment Branch, Navy Bureau of Ships, brought out these facts and figures recently in a presentation to the Senate Select Committee on Small Business. He emphasized that under mobilization conditions, the investment in new machines would be amortized in less than four years (on a 2½ shift operation).

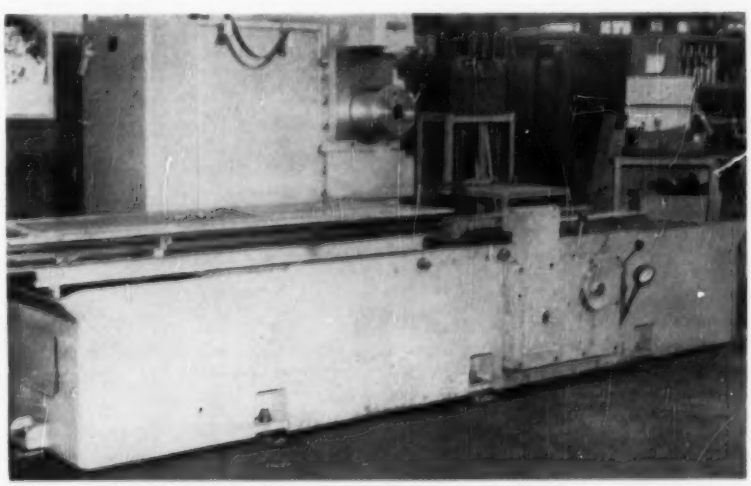
The determination of the exact tools to be replaced is based, Mr Weisbecker said, on a modification and simplification of the MAPI formula. It came out of a machine tool replacement study started in February 1955 covering 72% of all machines in Navy shipyards and the repair facility. (*American Machinist* July 4, 1955, pp156-157).

A modern milling machine designed for maximum utilization of carbide tooling and equipped with a 50-hp motor is capable of doing a machining job on a steel forging nine times faster than the old machine now in one of the Navy yards, Mr Weisbecker stated. This is only one example of many savings that could be made.

Replacements in the Navy yards the past three years have averaged only $1.5 million, or 1% of the value of machine tools in those yards, he pointed out. What's worse, for fiscal 1955 the amount dropped to $400,000, and in fiscal 1956 it is nearer $300,000.

If this downtrend continues, Mr Weisbecker warned, "we will be confronted by an alarming rate of obsolescence in our production shops. Maintenance costs will increase progressively with resultant lower productive efficiency and waste of floor space and of skilled manpower.

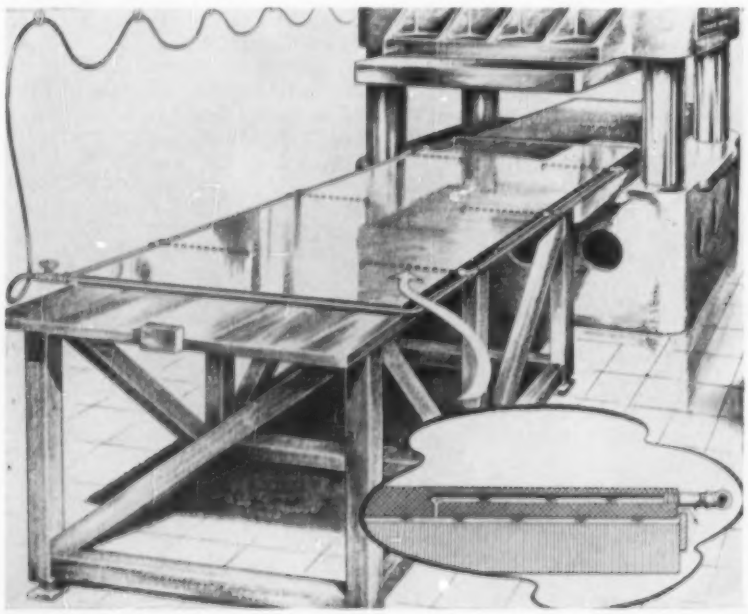
Should the Vance Plan criterion for replacement be used (5% of the value), the Navy would spend $7.5 million a year for modernization of its yards. The sum would go up to $12 million annually if the standard used by US industry were applied, Mr Weisbecker claims.



BOLTLESS INSTALLATION OF CINCINNATI PLAIN HYPOWERMATIC is one of 350-400 similar machine mounts at Caterpillar Tractor Co, Peoria, Ill. Leveling screws (eight for the miller) bear on steel plates, which rest on "Air-Loc" pads. These are sisal, vinyl, and cork compound that dampens transmitted noise and vibration, and provides enough friction between machine and floor so machine doesn't move when running

Half-ton Tooling Walks On Air Into Press

TOTAL DIE WEIGHT up to 1500 lb floats like a feather on 100-psi air, can be moved by fingertip pressure



SCORPION F-89D interceptor and Snark SM-62 intercontinental-missile parts are produced in this setup, with six ⅛-in. orifices providing lift

HAWTHORNE, CALIF—A transfer plate and a heavy die with a combined weight of 1000 lb float like a feather on a thin cushion of air in the heavy-press department of Northrop Aircraft, Inc, as a result of a novel application of pneumatics, developed by Northrop tooling engineers.

Six evenly spaced ⅛-in. holes inject compressed air at 100 psi against a hydro-press table to lift the heavy tooling plate and die. Only 5 lb of pressure is necessary to move plate and die under the press when the air is turned on. Five men would be required otherwise.

Northrop engineers were confronted with the problem of placing rollers under the heavy press dies or devising some other means of positioning the tooling. Rollers would have to be removed before the press could be operated. A one-fifth scale model of the pneumatic device was built. Various orifice positions were tested until proper balance was acquired. The model lifted 1500 lb with ease.

Flanges on the side of the magnesium tooling plate, which was used as purchased without machining, keep the plate in alignment with the press table.

Northrop engineers point out that accurate positioning under the press may be achieved by installing automatic shut-off cams for the air supply which can be adjusted to stop travel of the tooling plate at any point.

D B Hugill and Robert A Bridwell, Northrop tooling engineers, are responsible for development of the device.

Production Level Up 8-9% For Screw-Machine Shops

MILWAUKEE — Overall screw-machine-products business is running 8-9% over last year's comparable period, noted Clarence A Button, newly elected president of National Screw Machine Products Assn, at the society's annual meeting, April 4. He cited last year's total — $500 million — and said the only recent cutbacks had been seasonal dips in the automotive field which were largely over.

Other officers elected include Dana B Jefferson Jr, Walker Mfg Co, vice president; Leonard R Schaffer, Mechanical Art Wks, treasurer; Orrin B Werntz, re-elected executive vice president; and Margaret S Ballinger, re-elected secretary.

Gold-plated and engraved micrometers were presented to three members to signify more than 40 years of service to the industry. Recipients were Harry L Adams, Weatherhead Co of Canada; William E Bechmann, Western Machine Co; and Henry A Mueller, Mueller Machine Products.

Mr Button will accompany Mr Werntz on a two-week tour of West-Coast plants, during which they will talk to more than 50 producers.

Urge Aircraft Production-Engineering Teamwork

NEW YORK—Production men must be in on design plans early in the game if aircraft bottlenecks are to be broken. This was the agreement reached when aircraft design and production men sat down together to thrash out their differences at a panel assembled for the SAE National Aeronautic Meeting here, April 9-12. The panel was sponsored by several SAE groups.

One point regarding drawings was discussed; the need for early prints of the work, even in an incomplete stage. Revisions can be made by sending changes to production the same way changes within engineering are handled.

Disagree on Liaison

Two liaison methods brought up sharp disagreement; roving production planners can be assigned to either production or to engineering. But there was general agreement that something of this sort is required. A point in general agreement is that if production knows about what to expect, it can do tentative planning and procurement to speed later work.

Master schedules are growing in use to cover development and production phases of a new model. They are jointly prepared by all departments concerned, then an independent branch responsible to top management monitors them and takes action when delays develop.

Need Accurate Data

Machine capabilities are required in more detail, in exact capacity for each specific machine in the shop. This would eliminate delays when parts are scheduled on machines that can't actually hold tolerances required. But a warning was voiced that design thinking on future models should not be limited by any standard of capability of present equipment.

Production men emphasized the need for designers to alter tolerances without embarrassment when they are needlessly tight, for blind adherence to a drawing—just because it is a completed drawing—and an unwillingness to admit that mistakes are possible can be costly.

Automation Panel Talks Maintenance and Skills

NEW YORK — Maintenance of automated equipment and the potential broad usage of tape-controlled machines occupied the attention of the SAE panel on automation, April 9. H R Foss of Ford said preplanning in automated lines is necessary to provide repair stations where defective parts or assemblies can be sidetracked while good parts continue to flow.

Automation Downtime

Automated lines can't be labeled with a predicted breakdown-loss factor. They are, generally speaking, about 80% effective; but this figure is exceeded where adequate preventive measures are taken. These may include operating on two shifts to give maintenance time to effect repairs, working closely with machine builders and other users to improve components of equipment, and following J I C standards on electrical and hydraulic equipment. Great strides have been made in avoiding hydraulic troubles by operating equipment well within design pressures, rather than at maximum.

Downtime records and the reasons for downtime are essential to planning effective maintenance. With such records, and with the advice of machine suppliers on necessary repair parts, parts can be on hand for immediate replacements. Higher efficiency on the lines also results from adequate training and stationing of maintenance personnel.

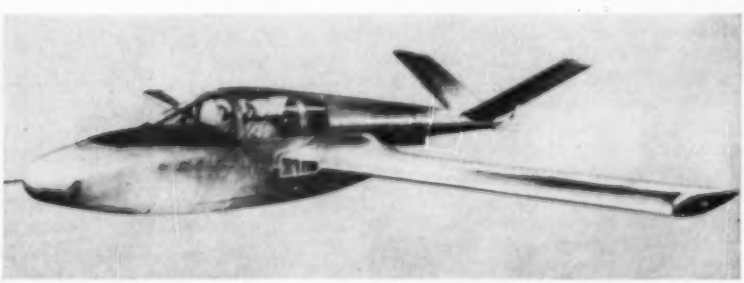
Getting Flexibility

Engineering changes on the product have profound effect on automation. One solution is "building-block" units with standard bases, and heads with a standard dimension of shaft height above the base.

So far, numerical control has been applied only where high investments are justified, as on special military goods. But the panel consensus was that simpler and cheaper machines will soon be available, and an upsurge in their use may be only a year or two away. Tape controls don't at present compensate for tool wear, but when they are applied to larger production lots, automatic gaging and tool resetting may be required.

Who Should Know What

Two schools of thought were aired on what the tool engineer should know about servo systems, electronics, hydraulics, etc. Machine-tool representatives thought machine designers should have basic principles to allow them to work with component suppliers. Electronics suppliers think machine designers should work out the sequence of events and motions required, then consult specialists for the planning on how to get them. Generally, the panel felt that process engineers and those who influence machine buying should be up on major hydraulic and electronic developments to help guide selection of equipment.



WEEJET TRAINER WITH SIDE-BY-SIDE SEATS is unusually small design being evaluated by Navy. Powerplant is Continental J-69-T15 centrifugal-flow engine with 900 lb thrust. Airframe only weighs 3000 lb, and is planned to operate up to 28,000 ft at 325-mph cruising speed. Acceptance might save a lot of money on construction costs

SPECIALLY CONSTRUCTED machine-tool hall features catwalks and an overhead traveling crane. Underfloor areas are available for press foundations and materials storage

Communists Push Tool Exports at Leipzig

LEIPZIG, EAST GERMANY (Special Correspondence) — More than 1000 machine tools, 10 complete industrial plants and other goods worth $162 million were sold by East German manufacturers to China at the Leipzig Fair. Most of the Communist-block nations exhibited machine tools. Western Europe was represented by builders from West Germany, France, Belgium and Switzerland, the West Germans predominating. The mammoth Krupp organization participated in the Fair for the first time since the war, having a capacious stand with conference rooms but not products.

Perhaps because of emphasis on exports, names of well-known East German machine tool builders have been resurrected after years of political oblivion. East German sales agents are reported to have had trouble selling machines from "8th of May Factory in Karl Marx Stadt" whereas they can get orders for the same machines bearing the name Niles. The former name of the city, Chemnitz has not been restored.

The State-run machine tool sales organization for East Germany lists India, China, Uruguay, Holland and Belgium as customers. Orders were taken at the Fair for several machines for delivery to Britain.

Expanded Lines

East Germans displayed their first four-spindle automatic with 130 mm turning length and 25 mm capacity, made at a former Pittler factory. Machines of 42 mm and 64 mm bar capacities are now being built. A six-spindle automatic of the same design is to be made this year. A large hydraulic shaper featured the column and cross bed in one integral casting. Maximum ram stroke and table traverse are 32 in., with cutting and fast return strokes independently variable.

A new hydraulic copy-turning attachment, said to be adaptable to a variety of machines, was shown on a large facing lathe. Comparable equipment was displayed on a universal miller. Zeiss Jena optics were featured on East Germany's latest profile grinder, now fitted with a projection screen, and on several jig borers. Other machines not seen before at Leipzig: a vertical key seater, a five-station double-sided drum-type drilling and boring unit, an automatic grinder for tapered reamers.

A bevel-gear generator from the former Pfauter works represented the first of its kind made in East Germany. It uses the twin tool shaving method and can handle gears from 4 in. to 48 in. in dia.

East German machines have been greatly improved in quality of design and finish. Electric control components and assemblies from Western Germany are being installed on these machines.

Besides a wide range of heavy equipment, the Czechs showed some interesting refinements of existing tools (a cylindrical grinder fitted with a system for dynamically balancing the grinding wheel, for instance). The Czechs also showed a magnetic chuck designed for quick release of the work when the current is switched off.

A small calculator intended to establish cutting speed, power requirements, rpm and cutting time for operating a lathe was on exhibition at the Czech Hall. Seven known factors, such as tool hardness and rake, are preset on graduated potentiometers of the multiple Wheatstone bridge. The four other variable resistances are then zeroed in on corresponding galvanometers and the unknowns read directly.

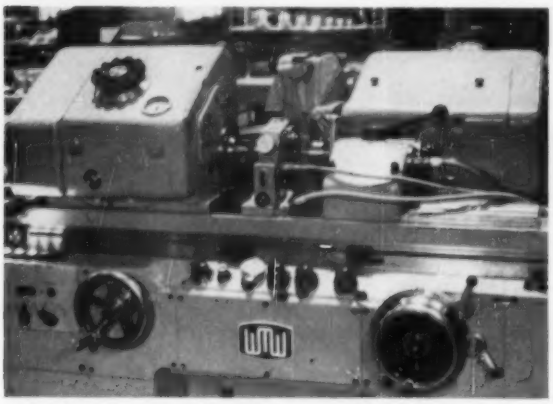
Russian Standardization

One section of the Russian exhibit was devoted to three automatic machines for gaging finished piston rings, output being 2400 pieces per hr. Similar machines check the width and thickness of rings to a tolerance of 0.002 mm. All share a large number of common parts.

Chinese machines showed considerable technical improvement and, while obviously copies of Soviet types, many appeared to be better finished than the originals. Among types shown were a new keyway miller, a centerless grinder identical with the one shown in the Polish display, a crankshaft grinder, and a special broach grinder.

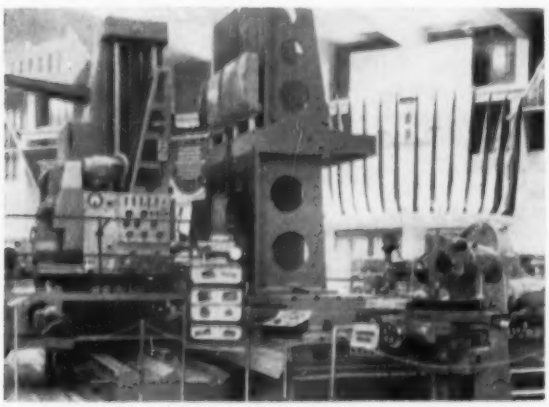
Poland's products revealed that several types of single-spindle automatics have gone into production. In addition to the pioneering 7-mm bar machine first shown at Leipzig last year, a 12-mm version is now available. A large planer-miller was demonstrated with four milling heads tiltable to 30° and 12 spindle speeds from 47.5 to 600 rpm. Polish emphasis on export of simpler machines to the under-developed countries of Asia and the Middle East was suggested by the demonstration of a hand-operated lathe.

Rumania claimed to have increased its machine tool production by six times in the past five years and to be doing a substantial export business. Among products shown were a universal mill, a planer, a pillar drill, and an engine lathe with a 1200-rpm top spindle speed.

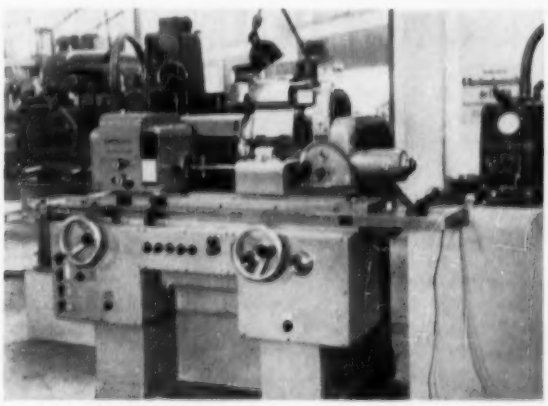


PRECISION CYLINDRICAL GRINDER, made in East Germany, has optical-electrical control and measuring attachment to permit visual observation during operation. Wheel displacement is determined by photoelectric cells which regulate hydraulic feed through relays. Tolerances can be preset

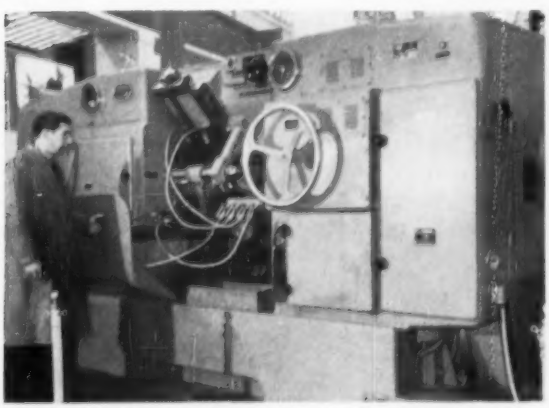
EAST GERMAN automatic transfer machine has seven stations, uses three basic types of standard drilling and milling heads, and produces 55 crawler track shoes per hr. Work is brought to loading station by conveyor, secured to fixture with pillar-mounted electric nut runner



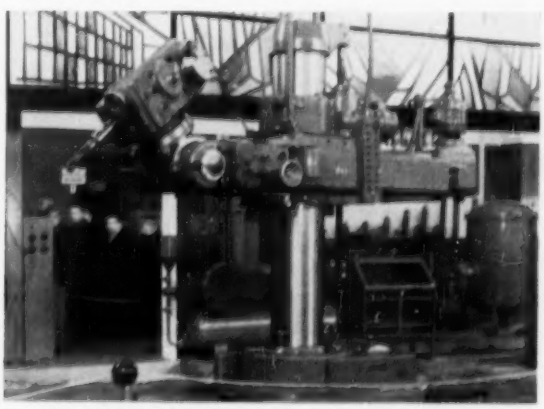
TRACER-CONTROLLED die sinker from East Germany is electrically operated in increments of 0.002 in., has capacity of 177X78 in., and copy-milling depth of 27 in. Small vertical mill alongside shares a number of common parts in its electrical copying control equipment



CZECH GRINDER features an attachment for dynamically balancing the wheel. Concentric knobs on shaft extension position movable counterweights which are adjusted until eccentric forces are balanced. Vibration is observed on oscilloscope fitted with a probe



BIGGEST OF ITS TYPE made in Russia is this four-spindle automatic with 4-in. bar capacity and 8-in. turning length. It has four longitudinal and four cross slides, with provision for external threading. Control wheel for hand work is power-assisted



ATTENTION-GETTER at Czechoslovak Hall was this radial drill with swiveling and tilting head. Rotary motion through 360° is by hand ratchet, 180° tilt is power-operated. Column base travels on rails on bedplate. Spindle is 2 in. in dia, and 18 speeds range from 16 to 800 rpm

Robert D Black, executive vice president of Black & Decker Mfg Co, has been elected president and chairman of the board to succeed the late **Alonzo G Decker** (*AM*—April 9 '56, p191)

J B Perkins has been elected president of The Hill Acme Co; he succeeds **A C McDaniel, Sr,** named chairman of the board. (Other new officers listed below)

Lewis H Whitney, vice president of Whitney Chain Co, has been elected president. (Additional appointments listed below)

Names in the News . . .

Alonzo G Decker, Jr, vice president of Black & Decker Mfg Co, has been elected executive vice president of the organization.

Henry C Beal, vice president, manufacturing, of Western Electric Co, is retiring July 1. **Arthur B Goetze,** vice president, finance, will replace Mr Beal. **Harold V Schmidt,** engineer of manufacture, has been named to the new post of vice president-chief engineer. **A Pope Lancaster,** manager of the company's works in Kearny, NJ, has been appointed vice president, manufacturing, eastern area. **William E Burke,** manager of the Distant Early Warning Line project, which the company has undertaken for the US Air Force, has been named vice president, defense projects.

Ward A Folsom, assistant general manufacturing manager of Ford Motor Co's Ford Division, has been named general manufacturing manager. He succeeds **M L Wiesmyer,** appointed to the staff of the executive vice president of the car and truck divisions as manufacturing consultant

L L Hercik has been appointed vice president and general manager of The Hill Acme Co, Cleveland. **H W Sullivan** has been named vice president of the company.

Richard E Whinrey, general manager of Link-Belt Co's Ewart Plant in Indianapolis, has been elected a vice president of the company.

W E Rowe has been promoted to manufacturing manager of Borg-Warner Corp's Long Manufacturing Division. He was formerly quality control manager of that division and of the Detroit Gear Division, and Long Manufacturing Ltd. **L W Cartier,** assistant quality control manager at Long, has been named quality control manager of Long and Detroit Gear.

Douglas H Cleland has been appointed assistant manager of the assembly plant operated by Fisher Body Division, General Motors Corp, at Oakland, Calif. He was previously superintendent of the assembly plant at Janesville, Wis.

James E Trask, division engineer for coated abrasives at Minnesota Mining & Manufacturing Co, has been appointed head of the central machine design department of the engineering division.

Einar A Hanson has been elected vice chairman of the board of Whitney Chain Co. **Brenniss G Tyrrell** has been named executive vice president and treasurer, and **Leota G MacKenzie,** assistant secretary.

James L Lewis, formerly associated with Chicago Pneumatic Tool Co, has been named assistant to the president for administration and sales at Van Norman Industries, Inc. **Paul C Eberhardt** has been appointed assistant to the president for manufacturing and research. He was previously chief machine tool engineer of the Wright Aeronautical Division of Curtiss-Wright Corp.

Robert L Jenkins, quality control manager for Chrysler Corp's Dodge Division, has been promoted to methods manager. **Allan D Woodell,** assistant quality control manager, succeeds him. **J J Wetzel,** general master mechanic, machining and assembly operations, has been made manager of the pilot model program. **Emmett J Combs,** superintendent of the program, takes over Mr Wetzel's former duties.

Frank L Snyder, vice president of Westinghouse Electric Corp, and manager of the transformer division in Sharon, Penna, has been appointed to the staff of the vice president in charge of the apparatus products divisions. **John H Chiles,** who has been serving as engineering manager of the division, succeeds Mr Snyder.

Robert L Fairbank, sales manager of Towmotor Corp, has been made vice president of the company.

Edward R Gabriel, general sales manager of the Greaves Machine Tool Division of J A Fay & Egan, has been promoted to general manager. **Joe W Stewart,** sales analyst, has been named general sales manager-controller

Henry C Miller has been named national sales manager, Milling Machine Department, of US Industries' Axelson Division. He was formerly assistant sales manager of Elmes & King Division of American Steel Foundries Co

Joseph R Hager, Jr has been appointed director of manufacturing for Gar Wood Industries. He was formerly associated with Baldwin-Lima-Hamilton Corp as works manager of the Transportation Division. **A S Wurfel** has been named assistant director of manufacturing.

Richard H Marvin, senior project engineer of New York Air Brake Co's Watertown Division, has been named chief engineer of the Division's hydraulic equipment section.

M L Backstrom, assistant manager of Firth Sterling's Carbide Sales Division, has been promoted to assistant district sales manager of the company's Chicago district. **C C Krogh,** administrative assistant to the general sales manager, succeeds Mr Backstrom.

Wilbur Deutsch, formerly general sales manager of Trabon Engineering Corp, has joined Aro Equipment Corp, Bryan, Ohio, as sales manager of its industrial lubrication department.

J T Barclay, assistant fabricating manager of Aluminum Co of America's Vancouver, Wash, operations, has been promoted to fabricating works manager. He replaces **E D Mairs,** named manager of the Lafayette, Ind, works. **L W Meyer,** on the staff of fabricating division headquarters at Pittsburgh, has been appointed Mr Barclay's assistant.

Creed E Ray, Jr, has been appointed supervisor of the resistance welding and heat treating departments of Portland Copper & Tank Works, South Portland, Me.

William L Parcell has been named vice president of Ridge Tool Co, Elyria, Ohio. Prior to his promotion he served as sales manager; he will continue as director of sales.

James H Sutherland, Chicago district manager of SKF Industries, Inc, has been named midwestern regional sales manager. He succeeds **Philip A Carlson** who is retiring.

Thomas L Ward, manager of manufacturing services at the Dunkirk, NY, plant of Alco Products, Inc, has been appointed plant manager. He succeeds **W L Larson,** who has resigned. **L W Eger,** production manager of thermal products at the plant, takes over Mr Ward's former post.

Lester C Hill, assistant sales manager of H K Porter Co's Vulcan Crucible Steel Division, has been promoted to general sales manager.

Mitchell Arcy has been appointed vice president and factory manager of the Ace Tool & Machine Co, Detroit.

J S Peterson has rejoined Fairbanks, Morse & Co, Chicago, as manager of electronic sales, Scale Division.

OBITUARIES

John E Andress, 79, former board chairman of Barnes Drill Co, Rockford, Ill, died March 26 at his home in Rockford after a short illness. Mr Andress and Benjamin F Barnes organized the present company in 1907. He served initially as secretary, later as president, and was chairman of the board at the time of his retirement eight years ago.

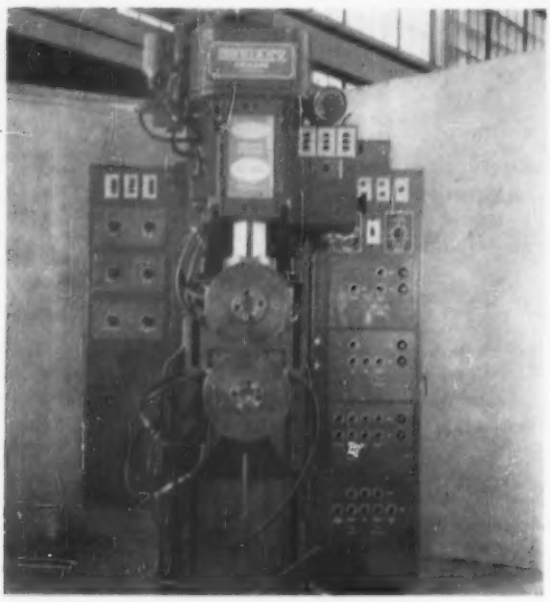
John T Hepburn, president of John T Hepburn, Ltd, Toronto, Canada, died recently. The company which he founded more than 50 years ago serves Canadian industry in the machine tool, material handling, and gear and transmission fields.

Russell C Mahon, 66, founder and board chairman of the R C Mahon Co, died at his home in Detroit March 30.

Robert W Thomas, 65, chairman of the board of McCrosky Tool Corp, Meadville, Penna, died March 26. Mr Thomas had been associated with the firm since 1924, served for twelve years as its president.

Alfred D Beeken, Jr, vice president, sales, of the Vulcan Crucible Steel Division, H K Porter Co, died suddenly at his home in Beaver, Penna, March 26.

New Shop Equipment,



Sciaky Resistance-Welding Control Counts Cycles of Line Frequency

Designed to be used with Sciaky resistance welders, precise timing control functions consistently to satisfy specifications for the welding of high-heat-resistant, heat-treatable metals such as those used in the aircraft industry, and is expected to overcome some of the problems connected with earlier controls. Through its ability to count the cycles of power line frequency, the timer control governs basic resistance-welder functions of "squeeze, weld, hold, and off," as well as additional functions such as preheating, quenching, and post-heating. The accuracy of this time is parallel to power company line-frequency requirements.

Heart of the unit is the dekatron tube, a cold-cathode gas tube having ten cathodes, with two guide pins between each pair of cathodes. When power is applied to the tube, a negative voltage is applied to the cathode which is to be fired. When the counting operation is started, pulses are fed to the guide pins and thus the glow is transferred from one cathode to the next until the count has been completed. This count may be any amount from one to ten, and any operation which will furnish a pulse may be used to trigger the tube.

By adding a decade dekatron, the count can be increased to 100. Adding a third dekatron will increase the count to 1000, the maximum count of any of the functions on the machine.

Control design incorporates plug-in sub-assembly units which provide a minimum maintenance down-time. Defective units can be removed and replaced in a matter of minutes. All welder functions are synchronous; control dials for timing operations are calibrated in cycles, while dials for interval functions are calibrated in impulses of secondary current.

The actual functions produced by the welder are the same as the control settings, regardless of the number of secondary current impulses, over the entire range of adjustment. Weld settings are readily duplicated.

Rectifier used with the control is said to be a radical departure from company's older design, being more precise and having a wider range of heat control. A phase-shift control dial provides for approximate linear adjustment of secondary current; phase-shift control with a stepless vernier provides for ten equal divisions of heat adjustment.

Sciaky Bros, Inc, 4915 W 67th St, Chicago, Ill

Kennametal Steel-Cutting Carbide

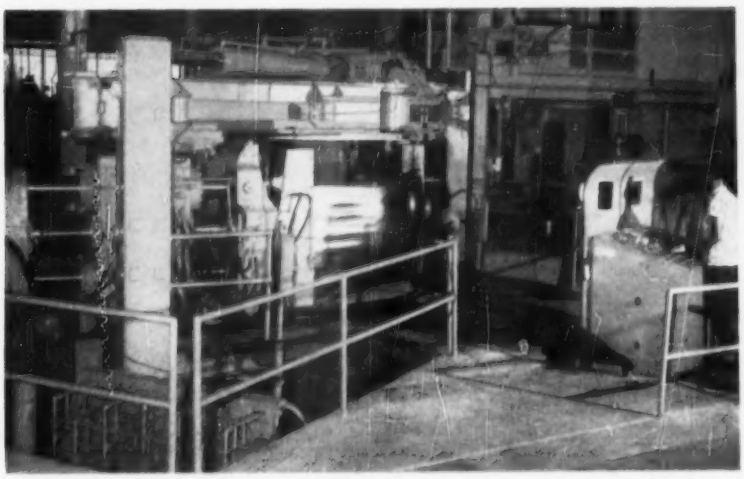
K7H steel-cutting grade is a hard carbide with hardness of R_A 93.5. Grade was developed for all types of finishing operations, and is reported especially suited for tracer or profiling applications. Best operating conditions are at high cutting speeds at light-to-moderate feeds.

Material is reported successful in machining steel alloys, Inconel, high-tensile steels, 400-series stainless steels, and nickel-base alloys.

Because of its extreme hardness, K7H is being produced only in button or throwaway-type inserts. These inserts are available for most styles of Kendex tooling. Material is not recommended for solid or brazed tools. After all edges have been used, it is economical to discard the insert.

Kennametal, Inc, Latrobe, Penna

Materials and Parts . . .



OPERATOR AT CONSOLE controls rate and strength of pressure applied on metal sheet

Hufford Stretch-Wrap Press Fabricates Sheet-Metal Aircraft Parts

Designed for San Diego plant of Convair, Hufford stretch-wrap forming machine can be adjusted to work automatically or manually from a desk-size console. The stretch equipment is hydraulically operated.

A stretch form molded to the curves desired in a sheet of metal is mounted in the center of the machine. The sheet is locked into hydraulically actuated jaws beyond both ends of the form. Pressure is applied by pulling the jaws backward and away from the form, thus stretching and wrapping the sheet simultaneously. Machine differs from most stretch-forming equipment, form remaining stationary.

STAINLESS-STEEL SHEET is inserted into jaws of stretch-wrap forming machine

Press can handle metal skin up to 12 ft long by 6 ft wide. Thickness range of sheets that can be handled is from 0.016 to ¼ in. The pulling capacity is 318,000 psi.

Press will be used by Convair to produce larger aircraft skin segments, thereby reducing number of parts and rivets required.

Hufford Machine Works, Grand Ave at Sepulveda Blvd, El Segundo, Calif

Correction — The Carroll-Jamieson Machine Tool Co 16-in. lathe described in a recent issue (*AM*—Mar 12 '56, p253) was incorrectly described as offering infinitely variable spindle speeds from 30 to 150 rpm. Correct speeds range from 30 to 1500 rpm.

. . . including

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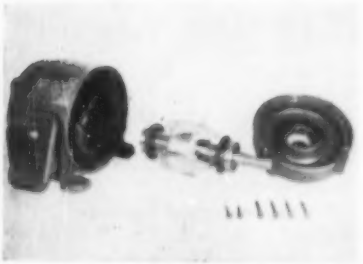
Allis-Chalmers Motor Combines Constant Speed, Rugged Construction

An improved variation of a reluctance-type motor, the Synduction motor was developed by combining the constant-speed characteristics of the synchronous motor with the rugged mechanical construction of the induction motor. Motor requires no brushes, slip rings, or windings on the rotor, separate source of direct-current excitation, or special starting equipment as is the case with standard synchronous motors. Its ability to operate at constant speed distinguishes it from the standard induction motor, in which speed changes with load and voltage.

Motor is reported to approach the efficiency and power factor of squirrel-cage units. It starts as an induction motor with a very high locked-rotor torque, accelerates and pulls into synchronism quickly, and runs as a synchronous motor. Having a high (175 to 200%) pull-out torque, motor remains in synchronism regardless of load or line voltage fluctuations.

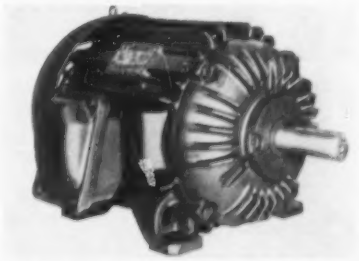
Motor has been designed to operate over a wide frequency and therefore a wide speed range. Frequencies of 300 cycles and speeds



DISASSEMBLED SYNDUCTION MOTOR showing simple, die-cast rotor. Synchronous motor has operating efficiency and power factor approaching that of standard squirrel-cage motor

above 10,000 rpm are available. Motors for frequencies as low as 10 cycles have also been developed. Machine has been built on integral horsepower frames in sizes from fractional horsepower ratings through 40 hp.

Maker reports that motor can be used effectively in the following applications: where motor must operate at a constant, unvarying speed; where several motors must operate at a fixed ratio of speed of one to the others; and where the speed of a motor or series of motors must be ad-



FAN-COOLED MODEL is totally enclosed. Various types of enclosures, mountings, frames, shafts, and arrangements for horizontal or vertical operation are available

justable over a speed range, with minimum variation at any speed setting. At the present each Synduction motor design has been engineered for individual applications. Inquiries should include such information as inertia of load, time of acceleration required, load conditions, speed range, enclosure required and characteristics of the electrical supply.

Concurrently with the development of Synduction motors, Norwood Works has developed an electro-mechanical drive to supply variable frequency for the motors.

Motors need only standard across-the-line starting equipment, except in the largest ratings, where reduced voltage starters are required.

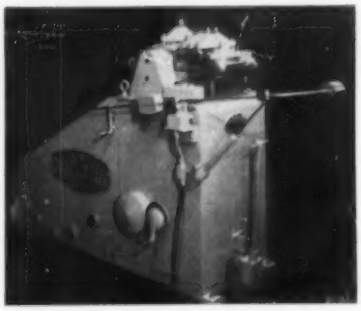
Allis-Chalmers Mfg Co, Milwaukee 1, Wis

Double-End Grinder Handles Large Single-Point Tools

Style 48-B, equipped for either wet or dry face grinding of large, single-point tools, can be used for roughing out all sizes of shanks. With appropriate wheels, machine will recondition tools of HSS, cast alloys, and carbides.

Two 10-in. plate-mounted wheels are used. Wheel shaft rotates in sealed, permanently lubricated, heavy-duty double-row ball bearings. Spindle drive is through a V-belt from a reversible motor set in grinder base. Tool-rest tables are adjustable to required sharpening angles, and may also be adjusted to compensate for wheel wear. Safety features include heavy sheet-metal guards attached to table brackets, and moving with them, to prevent tools from dropping into wheel recesses. Pressure coolant system with its own tank and pump is furnished.

Ex-Cell-O Corp, 1200 Oakman Blvd, Detroit 32, Mich.



U S Tool Machine Combines Coil Cradle and Straightener

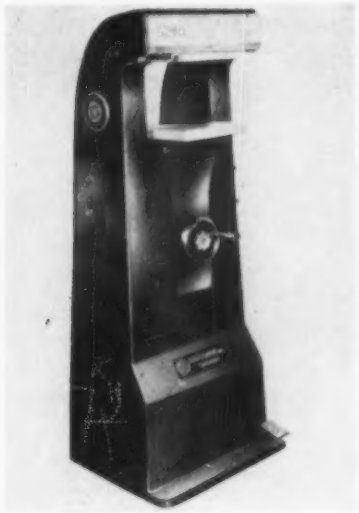
Model PDSC-940 coil cradle and power-driven straightener will handle material up to 9 in. wide and with thickness of from 0.025 to ⅛ in. Coils weighing up to 1500 lb and with OD up to 40 in. can be accommodated.

Entire unit is mounted on casters for portability. Cradle with five coil-rest rolls is mounted in self-aligning bearings. Inner side frames are crank-adjustable to accommodate stock width.

Straightener is equipped with six hardened and ground straightening rolls mounted in needle bearings; lower three rolls are power-driven. Two power-driven take-in rolls are also included. Straightener is of hinged construction to facilitate cleaning of rolls and starting a new coil. Indicators on rolls simplify setting of rolls.

Loop is controlled by a mercury-switch mechanism. Variable-speed drive of 2 hp provides outputs from 49 to 197 ft per min.

U S Tool Co, Inc, Ampere (East Orange), NJ



Schmidt Hydraulic Marking Machine

Model 365, a smaller machine than Schmidt Model 175, provides all the functions of the larger machine for normal marking operations requiring up to 8000-lb pressure. Maximum lettering length is 3½ in.

Compact unit is built with a heavy die slide which operates on roller bearings. Other features include simplified controls, recessed switch well with tell-tale light, and quick and simple adjustment of table and die-slide stroke.

Machine will mark lines of lettering with a knurl on flats up to 3⅜ in. long. It will mark lettering up to 3⅜ in. long on rounds rotating in cradle and up to 1 11/16 in. long on rounds which roll on table.

Marking capacity is 4 lines of 1/16-in. characters, 3 lines of 3/32- or ⅛-in. characters, or 2 lines of ¼-in. characters. Production is 800 to 1000 parts per hour.

Geo T Schmidt, Inc, Dept AM, 4100 Ravenswood Ave, Chicago 13, Ill

Metal-Bonding Adhesive

Structural-metal bonding adhesive called Resiweld will permanently bond aluminum, steel, zinc, copper, brass, iron, glass, wood, rubber, and plastic surfaces to themselves and to each other. Adhesive reportedly has good resistance to solvents, grease, water, and chemicals, as well as ability to withstand severe conditions of treatment and exposure. Trial kit is available for $1.00, together with technical information and direction pamphlets.

H B Fuller Co, 181 W Kellogg Blvd, St Paul, Minn

Sintox Ceramic Bits Cut Sapphire

Said to be fused rather than sintered oxides, Sintox ceramic bits, produced in England, are made up predominantly of aluminum oxide of 99.5% or better purity. Bits promise to be an inexpensive and efficient substitute for the hardest tungsten steels, carbides and, in many cases, industrial diamonds. Pinkish, opaque material reportedly is produced by the same basic fusion process by which synthetic diamonds have been manufactured.

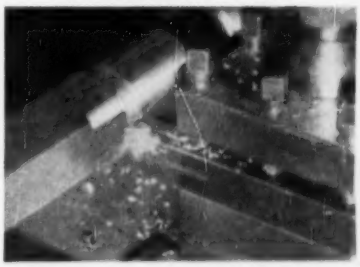
Material hardness, not yet precisely determined, is sufficient to cut sapphire. Maker claims material is harder than any known substance except diamond. Transverse rupture strength is reported to be 90,000 psi.

Tests recently made on SAE 1030 steel demonstrate versatility of material. At ⅛-in. depth of cut, feeds were from 0.006 to 0.018 ipr and speeds were varied from 50 to 1500 sfpm. At ⅛-in. depth, feed of 0.077 ipr was sucessfully used. Tests included roughing and finishing cuts, using the same tip, on round stock, and interrupted cuts on square stock.

Sintox is available in round, triangular, and square bits for special split holders which have only two parts, shank and insert. Chipbreaker and chip groove are built in, and no pads or clamps are required. Bits are normally used as throwaways, though resharpening is possible with diamond wheels and a generous supply of cutting oil.

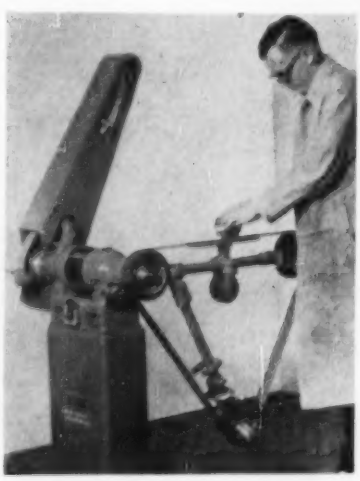
Company reports that milling cutters, boring tools, drills, finishing tools, and special wear-resistant parts are being developed from material.

Sintox Corp of America, 270 E Hamilton St, Allentown, Penna



INTERRUPTED CUTS on square stock can be made with recently developed ceramic toolbit

ROUGHING CUT on round steel stock is performed with Sintox throwaway insert



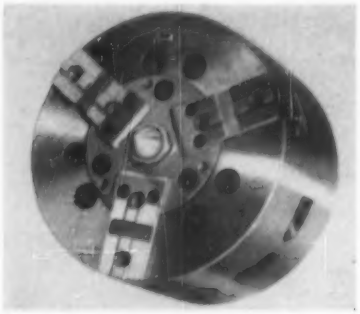
Curtis Multi-Purpose Machine Grinds, Polishes, Deburrs

Model DBA-1F Flex-A-Belt performs any of the basic abrasive-belt applications found in a grinding, polishing, or deburring department. Multi-purpose unit has rugged construction, totally enclosed motor, sealed ball bearings, automatic spring-loaded belt tensioning, and positive belt tracking.

Machine is a double-end motor unit and is available in three types: with two Flex-A-Belt arms; with one Flex-A-Belt arm and one standard contact-wheel grinding arm; and with one Flex-A-Belt arm and one side of the motor open for grinding wheel, buff, or brush application.

Extension-arm assembly can be rotated 360° on the motor hub for the most convenient operating position for the various applications. Power is supplied by a 1¼-hp, 3400-rpm motor. Base requires floor space of 29 x 40 in. Additional info in circular A-1357.

Curtis Machine Corp, 1300 E Second St, Jamestown, NY

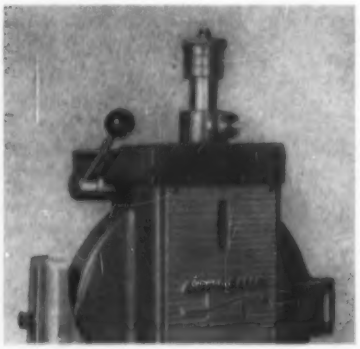


Compensating Power Chucks

Skinner Series 13100-A line of 3-jaw compensating power chucks comes in 8-, 10-, 12-, and 15-in. rated sizes. Chucks are for direct mounting on American Standard Types A-1, A-2, B-1, and B-2 flanged spindle noses. Units have forged-steel bodies, and are used to drive work on centers when high-speed, heavy-duty cuts are required. High-speed tool-steel center fits a standard Morse taper hole in the centerplate.

The 8-in. chuck features 1/16-in. compensation, and other sizes have ⅛-in. compensation, per jaw. Compensating action is achieved through three levers and a floating rocker. When power is applied, draw bar pulls the rocker, actuating the 3 levers and 3 jaws. Equal pressure to all jaws is assured, regardless of their gripping position on even or uneven work.

Skinner Chuck Co, New Britain, Conn

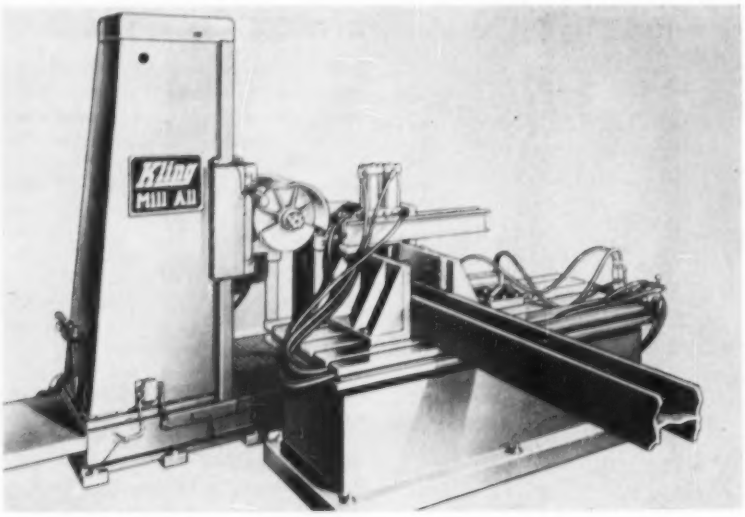


Abrasive Surface Grinders Have Built-in Wheeldresser

Hydrabrasive line of precision surface grinders can now be furnished with a built-in, hand-operated wheeldresser as optional equipment.

Device fits rigidly into grinder head, and has a micrometer adjustment for accurate measurement and control of amount of dressing.

Abrasive Machine Tool Co, East Providence, RI



High-Speed Face-Milling Machine

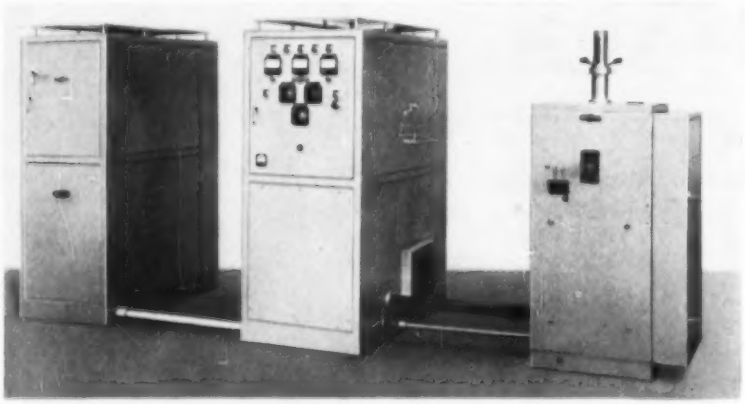
Kling Mill-All beam and column mill is designed to do such jobs as facing structural-steel beams and columns; facing steel and iron castings, forgings, weldments, and die blocks; and, using a tilting-head model, chamfering plates and bars. Machine may also be used for plate edging and can be adapted to mill aluminum and other non-ferrous materials.

Metal removal rates are from 40 to 80 cu in. per min, with cuts up to ¾ in. deep. Horizontal cutter travel ranges from 72 to 144 in., and vertical cutter travel is from 60 to 84 in., according to the various models.

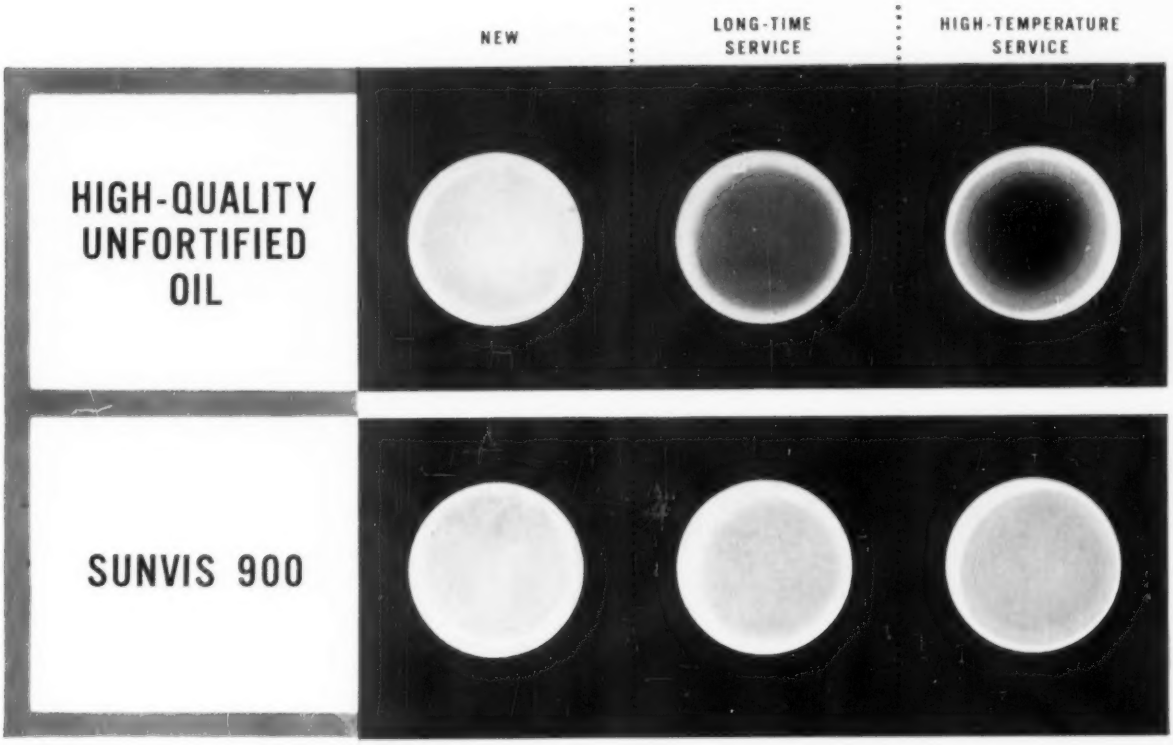
High cutting capacity is largely due to the specially designed, indexable-blade carbide face mills, which may be indexed to eight cutting positions before regrinding is required. Cutter-spindle drive motor is 40 hp, with 75-hp motor also available, and feed motor is 3 hp.

Pushbutton control panel mounted on the operator's platform travels horizontally with the machine. Primary construction of machine is welded steel. Telescoping steel covers are used to protect the horizontal ways. Motor is mounted in a slide which provides 10 in. of in-and-out travel of the cutter.

Kling Bros Engineering Works, 1320 N Kostner Ave, Chicago 51, Ill



CINCINNATI INDUCTION HARDENING MACHINE previously described (AM—Mar 12 '56, p213) consists of power supply unit (left), which may be placed in any convenient location; oscillator unit; and work unit (right), on which fixtures and tooling are mounted. Machine is rated at 30 kw and can harden solid parts such as shafts up to 2-in. diameter—*Process Machinery Div, Cincinnati Milling Machine Co, Cincinnati 9, Ohio*



Oil color tests show

WHY SUNVIS 900 OILS SAVE YOU MONEY IN CIRCULATING AND HYDRAULIC SYSTEMS

Color means very little in brand new oils. But...color *change* during service can mean a lot. While minor darkening is seldom serious, radical color changes indicate danger, except, perhaps, in a highly detergent oil.

Either the oil is contaminated by foreign matter, or as in the pictures, the oil has oxidized from heat and long use. The products of oxidation darken the color of ordinary oils...clog valves and filters, cause excessive maintenance.

Compare the appearance of the used Sunvis 900 with the appearance of the other used oil. The color of used Sunvis 900 is practically the same as new Sunvis 900. There is not a sign of oxidation products.

Here's proof that Sunvis 900 oils will last longer and provide the extra needed resistance against the high temperature "hot-spots" of typical hydraulic and circulating systems. *For the long run, a Sunvis 900 oil is the most economical oil you can buy.*

For more information about Sunvis 900 oils, see your Sun representative, or write for Technical Bulletin 35. Address SUN OIL COMPANY, Philadelphia 3, Pa., Dept. I-31.

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

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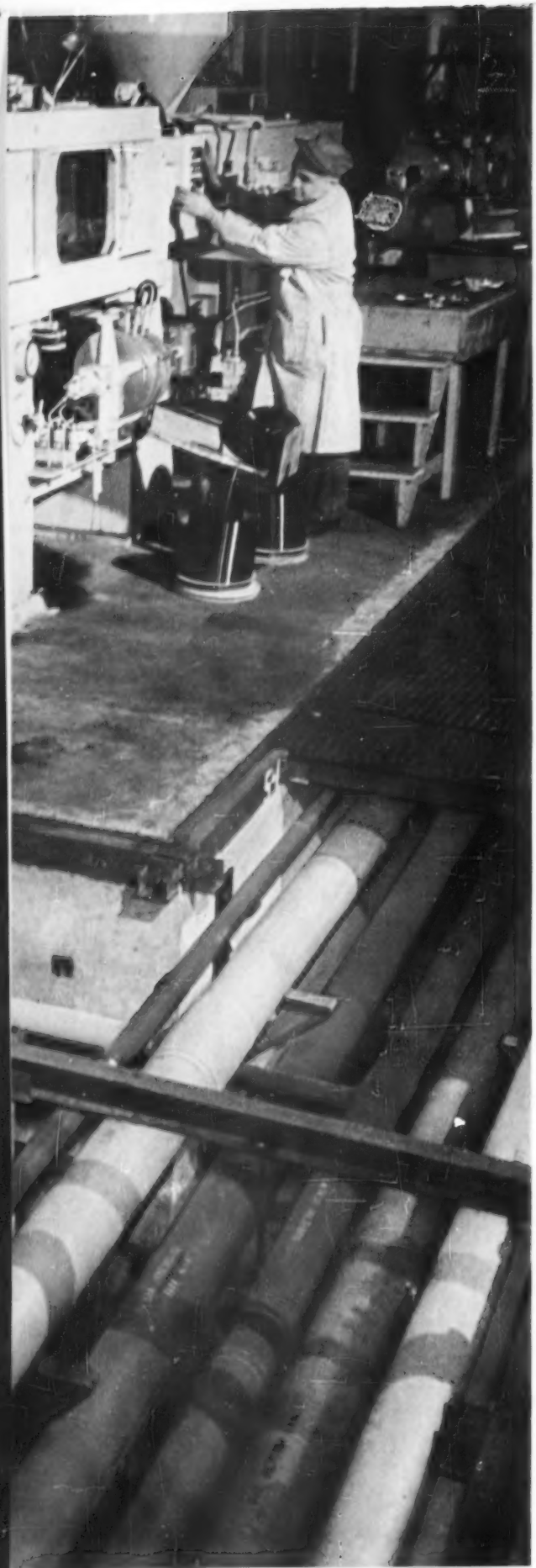
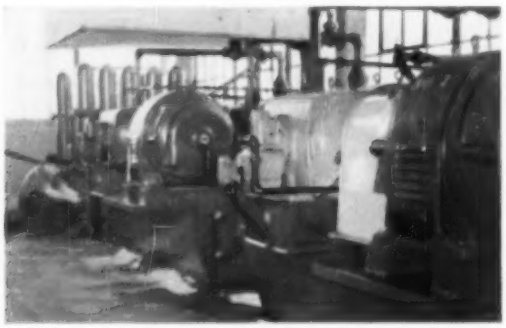


High-Pressure Pumps, below, each handle 54 gpm of Sunvis 931 at 2500 psi. Unique closed-loop hydraulic system, left, features color-coded piping.



NEW CENTRAL HYDRAULIC SYSTEM PROTECTED BY SUNVIS 931 OIL

The new variable-pressure hydraulic system at Columbia Records in Bridgeport, Conn., delivers oil at 2500 psi to as many as 40 injection molding machines. Round-the-clock production of micro-groove records depends on the reliability of this system.

Columbia picked Sunvis 931 because their tests and experience have shown it doesn't form carbon or leave harmful deposits...even after years of use. Because of their long life, Sunvis 900 oils are the least expensive oils you can buy for tight circulating systems.

This is just part of the story about Sunvis 900 oils. Why not talk them over with your Sun representative the next time he calls. Or write to SUN OIL COMPANY, Philadelphia 3, Pa., Dept. I-32.

SUNOCO

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SUN OIL COMPANY

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FYI
FOR YOUR INFORMATION

FREE Catalogs, Booklets, Charts, Calculators

FYI – these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail. We'll do the rest.

MACHINES AND ATTACHMENTS

1 GEAR DEBURRING & CHAMFERING MACHINES—*Modern Industrial Engineering Co, Detroit 38, Mich.* 12-page illustrated bulletin BM-1 contains information on 19 standard internal, external, and Duplex Burr-Master models. Also covers two standard interference relief grinders for hypoid teeth, and six special Burr-Masters.

2 SINGLE SPINDLE AUTOMATIC SCREW MACHINES — *Cleveland Automatic Machine Co, Cincinnati 18, Ohio.* 8-page bulletin gives illustrated description of line from 1 1/16 to 8-in. capacities. Engineering data and specifications included.

3 UNIVERSAL CUTTER & TOOL GRINDER — *Covel Manufacturing Co, Benton Harbor, Mich.* 12-page illustrated bulletin 125 covers No. 12A equipped with Pope 1-hp direct motor-driven tilting-swivel spindle. Design features, setups, attachments described.

4 DOUBLE ACTION STRAIGHT SIDE PRESSES — *Danly Machine Specialties, Inc, Chicago 50, Ill.* Illustrated 28-page catalog covers line of 200 to 2000-ton capacity units, including one, two, and four-point suspension presses. Special construction features described; specifications, dimensions, accessories detailed.

5 ROTARY GEAR SHAVING—*National Broach & Machine Co, Detroit 18, Mich.* 16-page catalog describes essentials and basic principles of the process. Operational elements, recent developments outlined; diagonal shaving described; available machines illustrated.

6 SLIP ROLL FORMERS—*Niagara Machine & Tool Works, Buffalo 11, NY.* 18-page bulletin 77 contains illustrated descriptions of new line for rapid forming of obround and rectangular shapes. power and hand-operated models are available. Selection and operational data included.

7 DIE CASTING SMALL PARTS—*DCMT Sales Corp, Port Washington, NY.* 23-page catalog contains illustrated, detailed description of specialized techniques used in high-speed die-casting process. Engineering data, machine features, case histories, installation and maintenance details, 4-page price list included.

TOOLS AND ACCESSORIES

8 ELECTRO-AUTOSIZING — *Electro-Autosizing Machine Div, Industrial Gauges Corp,* West Englewood, NJ. 4-page brochure illustrates and describes equipment and process of automatic and precise control of size during a work cycle by making size of workpiece itself control or stop the process. EAM electronic gage, a linear capacitance sensing device, is the basic element of equipment. Advantages and applications discussed.

9 CARBIDE TOOLS—*Carboloy Dept, General Electric Co, Detroit 32, Mich.* 46-page catalog GT-310 gives most effective cutting speeds, machine-tool hp requirements, determination of shank size of single-point tools, carbide tool geometries, grade selection. Includes price and specification data on tools and toolholders, throw-away inserts, blanks.

10 COLLETS—*Sutton Tool Co, Sturgis, Mich.* 4-page bulletin 10 presents illustrated description of collets for lathes, milling machines and grinders. Ordering instructions, price and specification table included.

11 OXIDE CUTTING TOOL—*Stupakoff Division, The Carborundum Co, Latrobe, Penna.* 4-page illustrated bulletin 156 describes Stupalox, said to outperform other tools two to ten times. Physical and mechanical properties discussed; detailed data on series of machining trials included.

12 HSS AND CARBON TWIST DRILLS—*Precision Twist Drill & Machine Co, Crystal Lake, Ill.* 1956 catalog A contains detailed data on complete line including straight shank twist drills and drill blanks as small as 0.006 dia.

13 HIGH-PRESSURE AUTOMATIC LUBRICATORS—*Bijur Lubricating Corp, Rochelle Park, NJ.* 2-page service instruction sheet describes design and operation of Type AA and AB units. Component parts of assembly illustrated; data

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on type of oil to be used, maintenance, specification tables included.

14 KENDEX TOOLING—*Kennametal Inc, Latrobe, Penna.* 12-page illustrated folder B-301 covers tooling with button-type throw-away inserts. Lists 200 tools in 17 holder styles, 11 of which are negative rake, the others positive.

15 VISE—*Illinois Metal Products, Chicago, Ill.* 8-page brochure presents illustrated information on IMP Hold-Down unit, operated with one hand; eliminates use of parallels or hammering. Advantages discussed; applications and setup pictured.

16 CONTROL FOR MAGNETIC CHUCKS—*DoAll Co, Des Plaines, Ill.* 4-page illustrated brochure covers Selectrons for automatic control. Three models, 150,210, and 400-w capacity available for direct or remote control. Operational details, advantages, specifications, and variety of installations discussed.

17 "55 PERFORATING PROBLEMS & THEIR SOLUTIONS"—*Pivot Punch & Die Corp, Punch Div, North Tonawanda, NY.* 20-page illustrated booklet covers wide range of problems involving all types of metals and thicknesses from 0.025 to 1.250.

18 MULTI-ROLL CRADLES—*US Tool Co, Ampere (East Orange) NJ.* 4-page bulletin 95 illustrates and describes units in two sizes for handling material up to 9 in. and 16 in. width. Features and specifications included.

HEAT-TREATING AND WELDING

19 LOW HEAT INPUT METAL JOINING—*Eutectic Welding Alloys Corp, Flushing 58, NY.* 16-page booklet describes process combining advantages of low application heats of brazing with greater strength of fusion welding. Case histories illustrated; applications chart covers more than 160 Eutectic low-temp welding alloys.

20 INDUCTION HARDENING MACHINE—*Cincinnati Milling Machine Co, Process Machinery Div, Cincinnati 9, Ohio.* 4-page descriptive folder M-1938 covers unit operating at 1200 to 1400 kc. Higher than average frequencies give high heat inputs, yet confine heat to surface. Operator can dial a tool change by varying the heat input to the coil, thus accommodate several different parts on a single coil. Remote power unit saves space.

PLANT SERVICE EQUIPMENT

21 HEATERS & HEATING DEVICES—*General Electric Co, Schenectady 5, NY.* 60-page bulletin GEC-1005G contains application index, calculating data, specifications, operating information, and list prices. Methods of heating and type recommended for various processes discussed.

22 COMPRESSED AIR PROBLEMS AND SOLUTIONS—*Van Products Co, Erie 7, Penna.* 20-page booklet discusses origin of moisture in compressed air systems, and what to do about it. Companion brochure "Moisture Control by Vi-Speed," describes method for removing moisture from air, hydrogen, nitrogen, and natural gas lines.

23 PROTECTIVE COATINGS & INDUSTRIAL ADHESIVES—*Magic Chemical Co, Brockton, Mass.* 25th anniversary catalog contains technical data concerning properties; applications described.

24 INDUSTRIAL LIGHTING UNITS—*RLM Standards Institute, Chicago 6, Ill.* 1956 edition of RLM Specifications Book (35 pages) contains important revisions in specifications on both incandescent and fluorescent units. New lighting data included.

25 BOLTLESS STEEL SHELVING—*Frick-Gallagher Manufacturing Co, Wellston, Ohio.* 12-page catalog 706 describes Klip-Bilt shelving. Construction and assembly features illustrated, as well as variety of models of open, closed, and ledge-type available.

26 ELECTRICAL TAPE—*Johns-Manville Dutch Brand Division, Chicago 19, Ill.* 12-page illustrated booklet provides data for choosing types for every insulating and protecting application. Technical information, characteristics, and performance specifications for plastic, friction, rubber, vinyl, and color tapes.

PARTS AND MATERIALS

27 SELF-ALIGNING ROLLER BEARINGS—*Link-Belt Co, Chicago 1, Ill.* 8-page book 2658 contains illustrated, detailed description of Series S, adjustable single-row bearings; Series D, adjustable double-row; and Series M, pre-adjusted double-row. Includes engineering selection data, dimensional specifications, recommended fitting practices.

28 LUNCOR VALVES & FITTINGS—*Lunkenheimer Co, Cincinnati 14, Ohio.* 6-page illustrated circular describes all-molded corrosion-resistant PVC valve. Advantages, installation data, dimensions included.

29 TOOL STEELS—*Uddeholm Co of America, Inc, New York, NY.* 44-page stock list No. 12 lists over 2800 individual sizes of air, oil, and water hardening tool steels. Separate sections for each grade list sizes of round, square, flat, and billet stock available. Contains special sections on hollow bars, sectional die steels, precision ground stock, and drill rods.

30 WIRE ROPE ASSEMBLIES—*American Chain & Cable Co, Wilkes-Barre, Penna.* 24-page illustrated catalog TL500 contains general information and specific details on Tru-Loc line. Ordering information and specifications included.

31 NUTS—*National Machine Products Co, Utica, Mich.* 24-page illustrated brochure contains engineering data on 12-Pointer and Hexagon Nuts, Huglock, and Marsden locknuts. Guide chart for calculating wrench torques, as well as all variables to be considered in relation to bolt tightness and wrench torques included.

32 QUENCHING OIL FILTRATION—*Industrial Filtration Co, Lebanon, Ind.* 4-page illustrated bulletin on Delpark filters describes operating principle, advantages, case histories, and applications.

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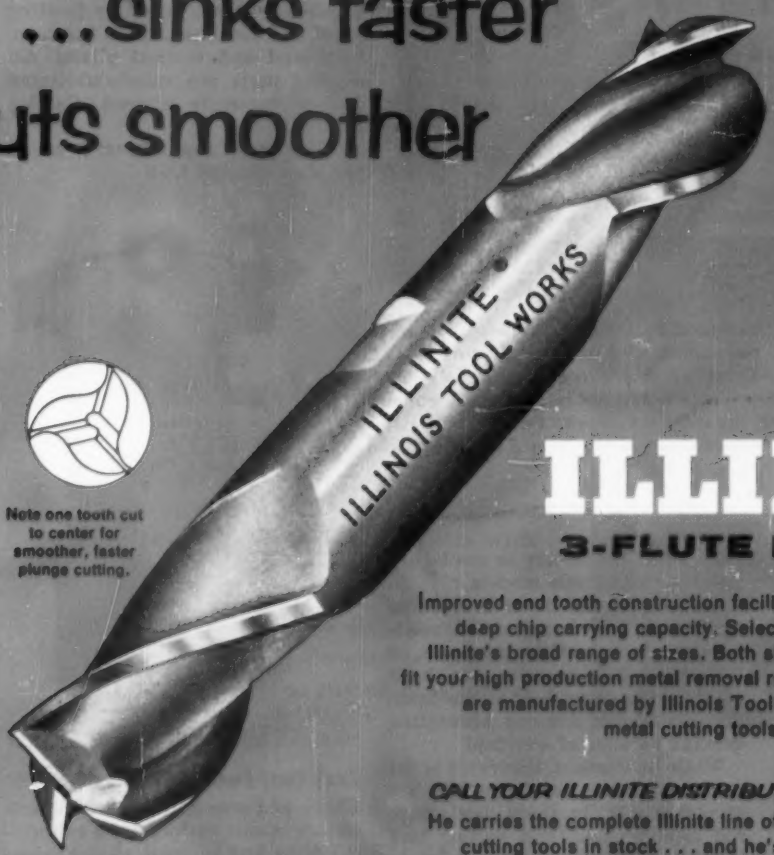
...sinks faster cuts smoother



Note one tooth cut to center for smoother, faster plunge cutting.

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3-FLUTE END MILLS

Improved end tooth construction facilitates sinking and provides extra deep chip carrying capacity. Select the 3-flute end mill you need from Illinite's broad range of sizes. Both single and double-ends are available to fit your high production metal removal requirements. Illinite End Mills are manufactured by Illinois Tool Works, a famous name in metal cutting tools for forty-four years.

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He carries the complete Illinite line of standard metal cutting tools in stock . . . and he's as close to you as your telephone.

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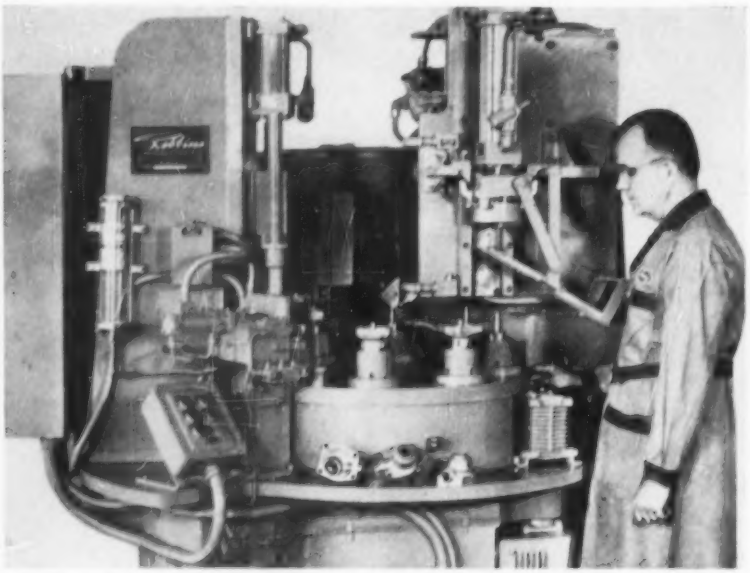
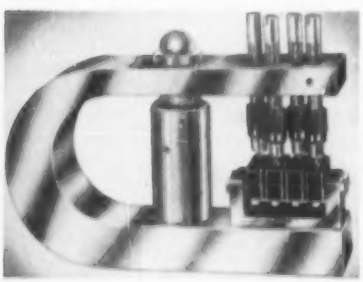
KEYSLOT CUTTERS • HOBS • SHAPER CUTTERS
• TOOL BITS



EIGHT-STATION ASSEMBLY MACHINE designed by Omer E Robbins Co automatically handles feeding, positioning, assembling, and removal of parts (consisting of a needle bearing, washer, and seal) which are assembled in an automotive steering gear end cover. Production rate is 720 per hour. Special panel with plug-in aircraft-type relays controls the electrical circuit. Panel is approximately one-third the size of the usual machine-tool panel—*Omer E Robbins Co, 24800 Plymouth Rd, Detroit 39, Mich*



Mechanical Force Gage

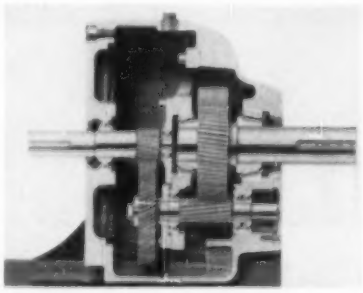
Dillon multi-switch force gage, a device for controlling mechanical forces at various load points, is available in 11 different capacities ranging from 0-10 to 0-50,000 lb. Up to four control switches can be mounted.

Basic design is an alloy-steel pressure beam made in the shape of a "U". To the lower leg of this beam is mounted a yoke in which switches are set. When load is applied across center of the beam, it deflects inwardly, causing the finely threaded adjustment screws in the upper half of the bar to contact the switches. On a 4-switch model, each switch can be set to function at a different load point within the range of the instrument, or all 4 switches can be made to function at the same load. Adjustment screws can be permanently set at the factory or can be obtained in adjustable models.

Gages can be clamped to working surfaces or bolted in place. A solid-steel bar is inserted in the beam, so that once full capacity has been reached, the upper half of the beam bottoms against this rod, preventing damage because of overload.

While instrument illustrated is for compressive use, tensile models are also available. In these, the center rod is eliminated, and pulling load is applied at two mounting holes on opposite sides of the "U".

W C Dillon & Co, Inc, 14620 Keswick St, Van Nuys, Calif

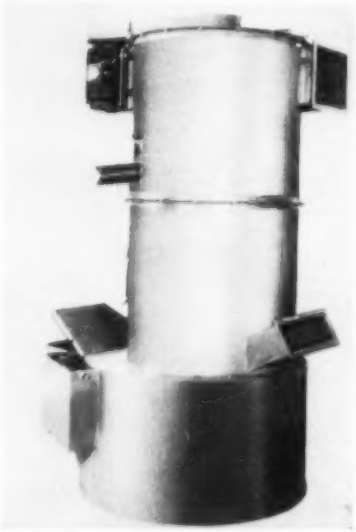


Link-Belt Helical Gear Drives

In-line helical gear drives are said to combine a high degree of standardization with ability to stand up in heavy-duty service. Double-reduction drives are available in ratios from 6.2 to 1 through 38.4 to 1, with capacities up to 118 hp. Triple-reduction drives are available in ratios from 47.1 to 1 through 292 to 1, with capacities up to 20 hp.

One-piece cast-iron housings have inherent sound-deadening properties. Space requirements and layout problems are minimized by locating input and output shafts in the same horizontal and vertical planes. All moving parts are splash-lubricated and permanently aligned. Catalog No. 2651.

Link-Belt Co, Dept PR, 307 N Michigan Ave, Chicago 1, Ill



Zack Dust-Fume Collectors

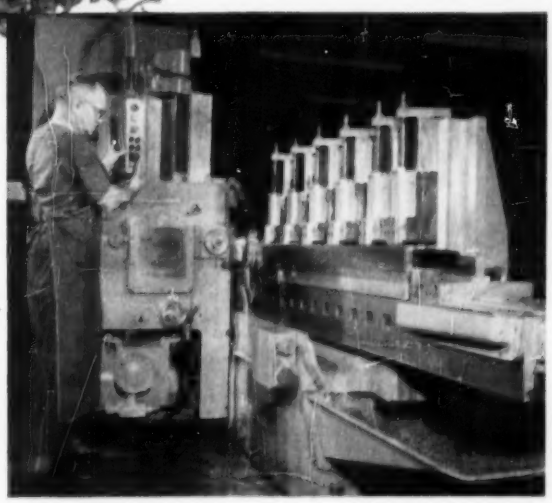
Floor- and cone-type dust-fume collectors consist basically of a cylindrical drum and internal wash-producing structures. Units incorporate a cone and baffle design said to produce a "cyclonic" washing action, which creates a turbulence which separates wet dust and carries it to a sludge tank for removal.

In operation, water cascades downward within the collector, resulting in a series of water curtains through which the dust and fume-laden air is filtered in its upward travel. A double row of moisture eliminators, fabricated in convenient handling size, are mounted above the washing chamber. Settling tanks at bottom of unit collect water for recirculation.

Units are available in capacities of from 500 to 40,000 cfm. Several models are offered.

Zack Co, 4600 W 12th Pl, Chicago 50, Ill

Machined Resistance Welding Forgings At the Cost of Rough-Forged Blanks



We save the scrap... so you save money

- Our new high speed milling machines finish rough forgings to your specs with high efficiency.
- On pieces over 50 pounds, the value of the milling scrap balances the machining cost . . . thus you pay nothing for the finishing operation.

FOR YOUR resistance welding applications, it pays to call on Mallory for forgings. You save the expense, time and trouble of finish machining. And you're assured of the best in alloys, job-fitted to your specifications, and produced to superior standards of quality and uniformity . . . by people who have pioneered in resistance welding for nearly thirty years.

Call on Mallory, too, for welding electrodes, holders, seam welding wheels, dies and accessories to meet standard or special requirements. For full facts, write to us today, or see your nearby Mallory welding distributor.

Expect more . . . get more from

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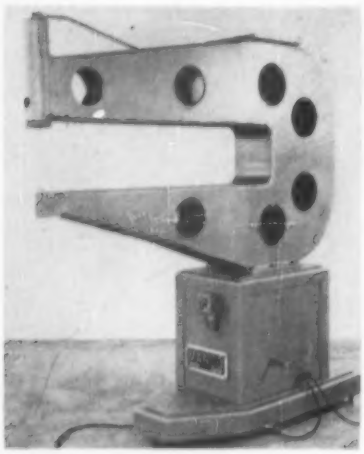
110 Industry Street, Toronto 15, Ontario

For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio



Hydraulic Riveter Handles Varying Thicknesses of Metals

Manco hydraulic riveter, designed primarily for work in aircraft industry, features system in which ram develops pressure as it meets resistance, until it develops maximum thrust of 12 tons. With this system machine can rivet varying thicknesses of metals without time-consuming adjustments of the riveting power stroke. Cycling is completely automatic, and the pressure obtained in the final thrust can be infinitely adjusted by one control.

An air-to-oil booster powers the unit, which develops maximum thrust at 80 psi. Unit illustrated has a 48-in. reach, but maker states reach can be designed to accommodate other requirements. Traverse stroke has a 6-in. maximum travel and power stroke a ⅝-in. maximum. Machine is designated Model MR-712-48-2.

Manco Mfg Co, Bradley, Ill

Tool Scales and Projectors

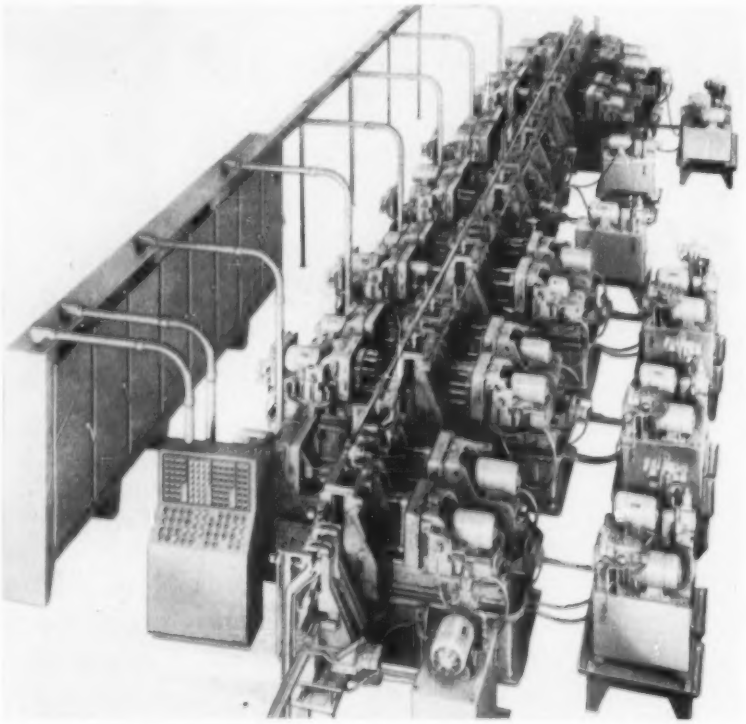
Hilger & Watts machine-tool scales and projectors, designed for use in multi-spindle boring operations, are helpful wherever it is necessary manually to position work quickly.

Precision scales are in solid mounts and are fully enclosed so that they are unaffected by coolant, dust, chips, or fumes. Projection screens with their micrometers are well out of the way of the work, yet visible to the operator. Horizontal motion of 9 in. and vertical motion of 4 in. are shown on two screens.

For quick positioning, optical micrometer is set to correct thousandths and ten-thousandths of an inch, then slide is positioned manually until the proper graduation appears on the screen. Because scale is figured every 0.05 in., at least two figures are always seen.

Distributed by Engis Equipment Co, 431 S Dearborn St, Chicago 5, Ill

TOGGLE CLAMPS in two models have been added to Caddy line of Erico Products. VQ-1 and VQ-2 feature linkage design that provides maximum bar travel with minimum handle movement. VQ-1 is rated at 1000 lb vertical clamping pressure; VQ-2 is rated at 2000 lb—*Caddy Arc Welding Accessory Div, Erico Products, Inc, 2070 E 61st Pl, Cleveland 3, Ohio*



TORQUE-CONVERTOR ADAPTOR PLATES of two types are machined on special Buhr Economatic, which performs 155 operations: 37 drilling, 12 reaming, 4 boring, 37 countersinking, 36 inspection, and 29 tapping. Unit has 22 stations and is 70 ft long; 200 pieces are processed per hour at 100% efficiency. Special features include automatic lubrication of moving parts, mist lubrication to spindles to maintain uniform temperature in heads, automatic depth inspection of all holes before tapping, all spindles arranged for pre-setting of cutting tools, and bases sectionalized to simplify processing changes. All standard and special machine parts are interchangeable—*Buhr Machine Tool Co, Ann Arbor, Mich*

SPOT WELDER TIPS are removed by tool called the Ejecto Tip Puller. Device tightens over the tip by means of a small high-leverage crank. Easy pressure on the handles then withdraws the tip quickly and without damage to either tip or horn—*Miller Electric Mfg Co, Inc, Appleton, Wis*

NEMA Type 12

THE FIRST SAFETY SWITCH IN SPECIAL INDUSTRY ENCLOSURE!

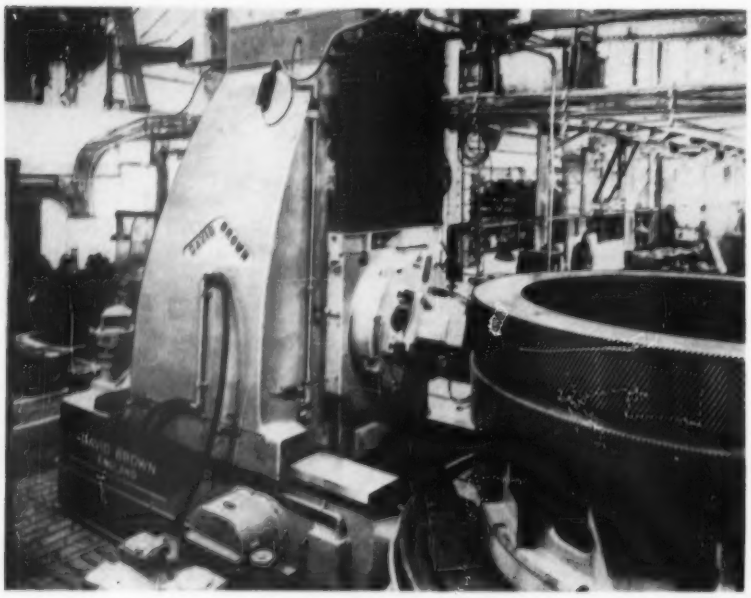
CAPTIVE SCREWS assure tight cover fit
EXTERNAL MOUNTING FEET eliminate need for conventional leaky mounting holes within the enclosure
NEOPRENE GASKET provides positive cover seal
WELDED TIGHT ENCLOSURE without knockouts excludes dirt, dust, oil, and splashing coolant

This heavy duty switch, built to NEMA XII specifications, is "tailor-made" for applications requiring the exclusion of dirt, dust, oil and coolant.

The rugged, visible-blade switch mechanism within the special industry enclosure has all the performance features that have made Square D an overwhelming "first choice" for fifty years.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY



Turbine-Gear Hobber and Shaver

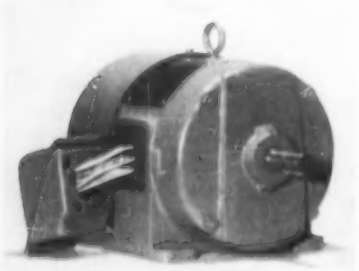
Dual-purpose machine for hobbing and shaving large turbine gears is one of line built by David Brown Industries Ltd of England. Line includes machines capable of producing turbine gears from 60 to 175-in. diameter, and pinions and first-reduction wheels from 6 to 60 in. in diameter. Four models are offered, each basically similar in design and operation.

Maker lists several advantages in combining two operations in one machine: one operator can perform both operations; delay in transferring gear from hobber to shaver is eliminated; replacing hob with shaving cutter after hobbing is completed means that one machine can be kept fully employed on a job.

When machine is required for shaving, shaving cutter is mounted on the hob swivel slide. Cutter is mounted on a large hardened and ground spindle which is carried in precision taper roller bearings. Swiveling of the cutter to the crossed-axis angle required is achieved by power or hand.

A shoe-type brake, fitted to the cutter spindle, enables the tangential-load method of shaving to be used, if required. Brake load is adjustable and the amount of torque on the cutter spindle is registered on a calibrated scale.

Imported by Morey Machinery Co, Inc, 383 Lafayette St, New York 3, NY



Enclosed, Fan-Cooled Motors In 1- to 5-hp Range

Two lines of enclosed, non-ventilated, fan-cooled motors in General Electric line are designated Standard Enclosed (illustrated) and Severe Duty Enclosed. Motors are designed to replace a single line of 1 through 5-hp motors.

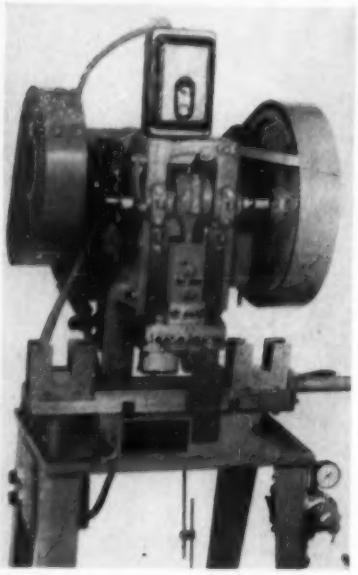
Standard Enclosed motor features a steel conduit box and fan cover. Conduit box has "keyhole" mounting for quick installation, mounting screws need not be removed; box is gasketed with cork neoprene. Fan cover, also of steel, is lighter, more rugged. Cast iron, for rigidity, is retained on the rest of the enclosure.

Severe Duty model (not shown) is provided with a redesigned shaft seal for improved moisture protection.

Small Integral Motor Dept, General Electric Co, Fort Wayne, Ind

Self-locking nuts, made automatically from raw steel to finished product, are addition to Jacobson line of locknuts. Upper portion of nut is slotted and bottom face is undercut, so that when the nut is tightened, the threaded upper segments move inward, causing the nut to produce a vibration-proof lock on the threads of the screw. Nuts are made of steel, brass, aluminum, or stainless, and are available in all machine screw sizes.

Jacobson Nut Mfg Corp, Box 177, Kenilworth, NJ



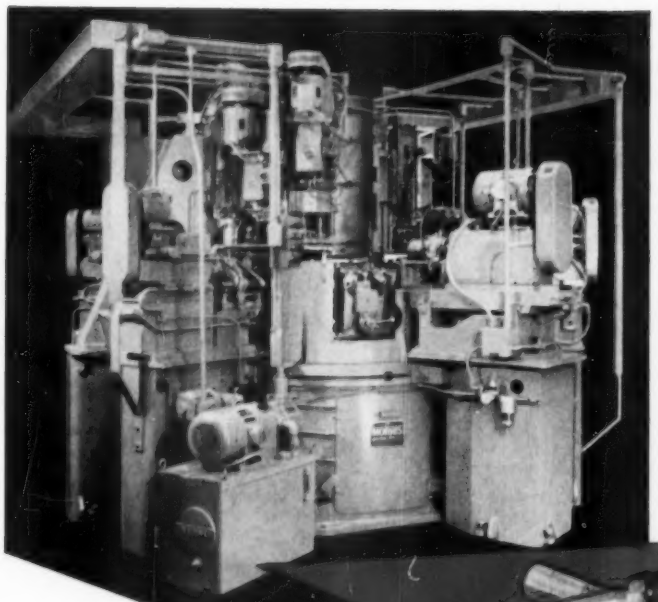
Noblewest Nameplate Stamper Offers Power Operation

Model 390 automatic, power-operated nameplate stamping machine features a power press equipped with a two-station stamping head for applying either constant, variable, or serial numbers on etched steel, brass, or aluminum plates. Press is equipped with loading and unloading magazines,, air-operated work feeder and work stacker.

Progressive serial number is applied by a Noblewest automatic numbering head which indexes consecutively with each stroke of the press. Variable or random data is set up in individual type or multiple-character logo dies in a holder mounted in the second station.

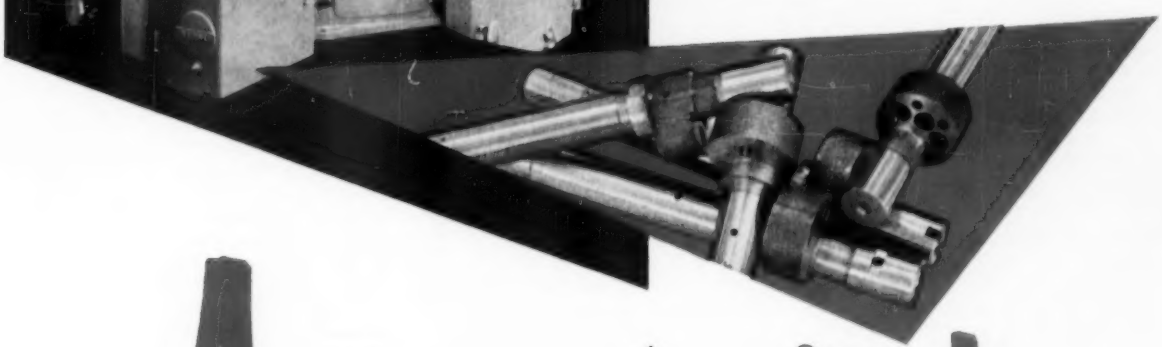
Press may be also operated semi-automatically. Air circuit is piped complete for connection to shop lines, and includes a combination air conditioning unit consisting of air-line filter, pressure regulator, gage, and lubricator.

Noble & Westbrook Mfg Co, East Hartford, Conn



EVERY 8 HOURS THIS PRECISION MACHINE

- DRILLS 8536 HOLES
- MILLS 776 FLATS
- MILLS 776 SLOTS



Automatically!

This MORRIS Model 322-S High Production Machine produces 97 refrigeration compressor crankshafts per hour at 80% efficiency. In each part it automatically drills 11 holes, varying in diameter from .125" to .375". Six holes, including one hole 4¾" deep, are drilled using gun drilling techniques. In addition, the machine mills one end slot and one chordal flat on the shaft.

These operations are coordinated through use of a MORRIS basic center column machine, equipped with a 48" dia. table, a 12-station automatic indexing mechanism, and 16 MORRIS AIR-OIL-Matic and Cam-Matic Drill Units.

The result is a completely automatic "special" machine, designed using a standard basic machine and standard drill units . . . at a fraction of the usual special machine cost. The machine may be altered for model changes, without scrapping a complete machine.

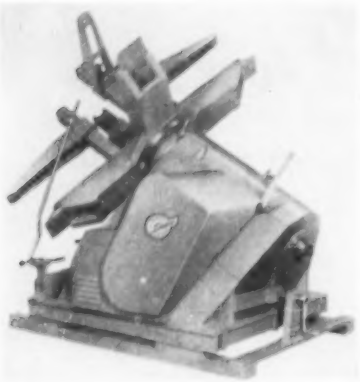
Investigate the production-boosting and cost-saving advantages of MORRIS Unit-Type High Production Machine Tools. WRITE TODAY for detailed literature, or outline your production problem for analysis by MORRIS engineers.

See our insert in Sweet's Machine Tool File

Builder of MOR-SPEED Line

Morris

MACHINE TOOL COMPANY
933 HARRIET STREET
CINCINNATI 3, OHIO



Sesco Stock Reel Offers Lateral Adjustment

Angular centering reel is mounted on rails to provide lateral adjustment for angular feeding of coil stock. Adjustment is made by rotating a crank at the rear of the reel; crank actuates a leadscrew which, through a bronze nut, moves the entire reel into the proper location. Crank can be operated by hand or motorized.

Reel is power-driven at a controlled rate, eliminating jerking and over-running. Its four expander arms are operated in unison, and will accommodate center IDs from 15 to 28 in. Device incorporates variable-speed drive, so that by a simple adjustment a shorter loop can be maintained on long-feed-stroke applications. Stock flow is controlled by an electrical loop control which regulates the pay-off. Drive is reversible, and automatic braking is provided.

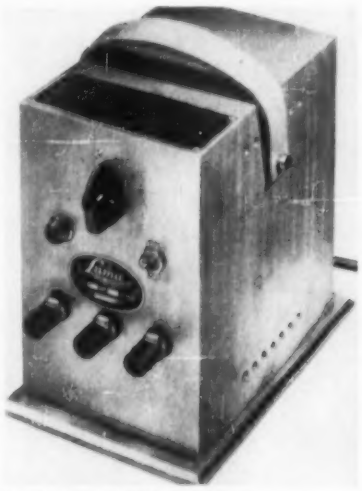
Sesco Inc, 8881 Central Ave, Detroit 4, Mich

Cylindrical Lapping Machine

Spitfire 6-in. bench-type cylindrical lapping machine is smaller version of company's 12-in. model. Machine is designed to provide micro-inch finishing of piece parts to 1 rms or less.

Design of unit eliminates use of rings, collets, and chucks. Rollers are vented to reduce "cooling off" periods. Other features include self-aligning ball-bearing pillow block, Oilite bearings, and 4-speed interchangeable pulley drive.

Spitfire Tool Co, 2931 N Pulaski Rd, Chicago 41, Ill

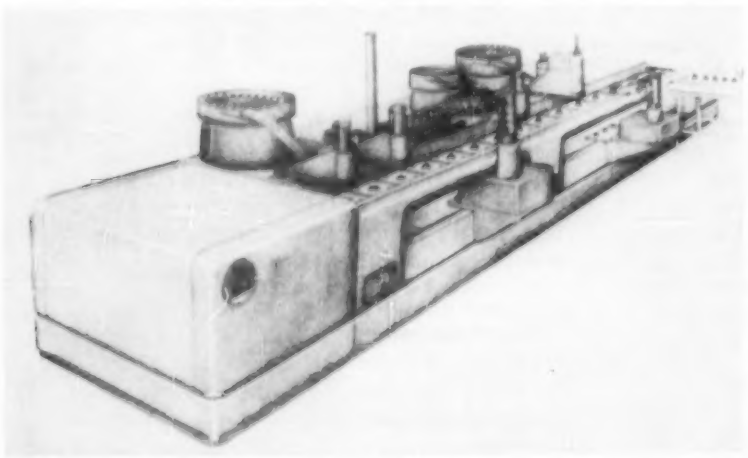


Resistance-Soldering Unit

Soldering Tool No. 626 from Luma Electric operates on 115v 60c with a wide range of power, from 5 to 1800 watts. Featuring a six-stage selector switch used in conjunction with three secondary terminals, unit obtains 18 heat stages or 18 different voltages from 1.3 to 5.1

Unit is reported to perform most efficiently when used with carbon electrodes under 3/8-in. diameter. Over 16 styles of holders are offered for jobs ranging from precision work to medium-heavy industrial operations.

Luma Electric Equipment Co, Toledo, Ohio



STRAIGHT-LINE TRANSFER MACHINE of Kenhos Corp can be adapted to sequence machining service in the machine shop or machine assembly in an assembly department. Machine is available in standard 8- and 12-ft sections, which can be bolted together for any length operation. Tooling attachments may be mounted on top, side or underdeck for 3-side operation at all work stations. Machine features hydraulic feed, with no moving parts except transfer mechanism. Machines are sold complete less tooling, or complete with all tooling, acceptance-run tested. Maker offers engineering service to help individual customers—*Kenhos Corp, 275 Connecticut Ave, Norwalk, Conn*

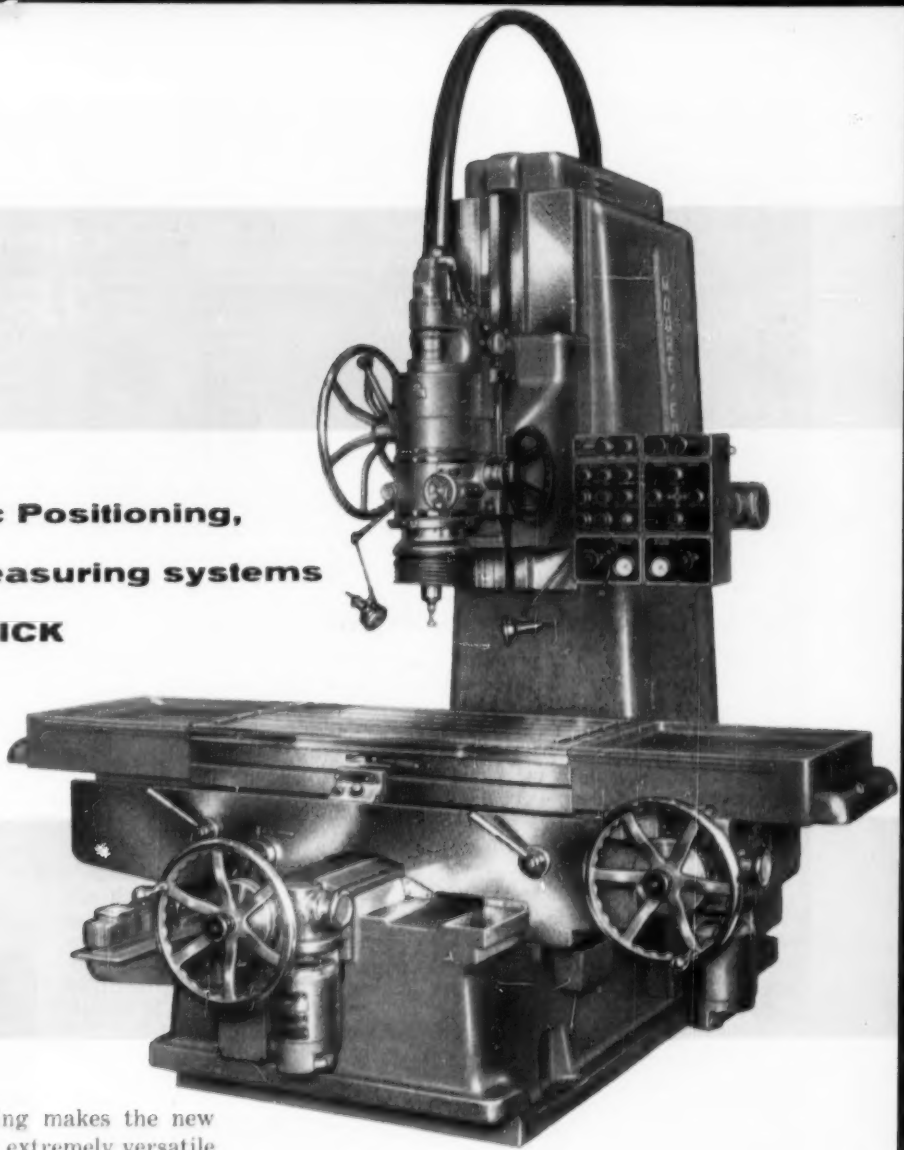
SHAFT COLLARS, equipped with precision, cup-point socket set-screws, are available in 44 bore sizes from 3/16 to 3 in. in 1/16-in. increments. In sizes up to 2 in., collars are machined from cold rolled steel with cadmium finish. Larger sizes are machined from cast iron with machinery gray-lacquer finish. All collars are machined with chamfered inside and outside corners and are precision bored. For convenience of users, collars are shipped with set-screws assembled—*Climax Metal Products Co, 863 E 140th St, Cleveland 10, Ohio*

NOW... Automatic Positioning,

choice of two measuring systems

on MOORE-FOSDICK

Jig Grinder!



Exclusive automatic positioning makes the new Moore-Fosdick Jig Grinder an extremely versatile machine! Besides large work capacity (22" x 44" or 18" x 36" x 27" height) you get increased speed and precision. At the touch of a button, table and saddle position automatically to ± .0001"!

A choice of two precision measuring systems is available. With the new and exclusive Direct Dimension Measuring, dimensions from blueprint are simply set on direct-reading drum dials. The other system, Rod and Bar Measuring, employs measuring rods, micrometers, and for high production work, duplicating bars. Either measuring system may be installed with or without automatic positioning, but both systems cannot be installed on the same machine.

On the Moore-Fosdick Jig Grinder you can grind conical holes with taper in either direction, as well as cylindrical holes. An angular and indexing device built into the main spindle, and the recently developed slot grinding attachment, give quick, accurate grinding of any contour — *regular or irregular*. Write for price and delivery information.

Other outstanding features include: infinite range of grinding speeds—12,000 to 60,000 rpm, contour and chop grinding, spindle-housing heat control.

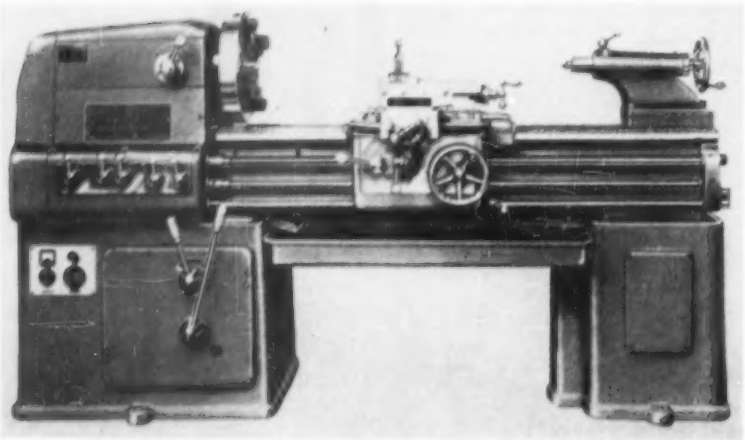
NEED JIG GRINDING EQUIPMENT? GET A PROPOSAL FROM FOSDICK!

Fosmatic Radial Drills | Jig Borers | Sensitive and Upright Drills | Sensitive Radial Drills | Jig Grinders | Automatic Positioning Jig Borers

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

FOSDICK

NEW SHOP EQUIPMENT, MATERIALS, AND PARTS



Precision Geared Toolroom Lathes

Imperial Type E Series of precision toolroom lathes is manufactured in Italy, and is available in models with 12-, 14-, and 16-in. swing. Machines have a precision spindle hardened and ground, machined from a chrome-nickel-steel forging; spindle is supported by roller bearings amply designed to take up thrust loads.

Spindle nose is standard American long-taper, key-drive type, with Morse taper. Nickel-steel gears are hardened and ground. All transmission shafts turn in anti-friction bearings.

Standard equipment includes tool post, two precision centers, dog plate, necessary wrenches, and instruction manual.

Imported by Aaron Machinery Co, Inc, 45 Crosby St, New York 12, NY

Heavy-Duty Grinder Offers Built-In Dust Collector

"Grind Air-rester" is designation for 12- or 14-in. heavy-duty grinder with self-contained dust-collecting unit built inside the grinder base. Motor-driven fan operates simultaneously with the grinder motor.

Dust-collecting chamber receives grit and dust by gravity into a drawer which is easily removable. Steel-wool filter pads are also removable.

Type 2GAR 2-hp grinder motor serves two 12 x 2-in. wheels. Type 3GAR 3-hp motor is for 14 x 2½-in. wheels. Grinding wheels are protected by safety guards which are adjustable to wear of the grinding wheels; each guard has a 4-in.-dia exhaust outlet, hinged door, spark-breaker, and work rest. A tool tray with removable water pot is located at the front of the pedestal.

Standard Electrical Tool Co, 2488 River Rd. Cincinnati 4, Ohio

All-Hydraulic Overhead Crane Has Infinitely Variable Speed Control

Three-ton overhead traveling crane, designed and constructed as an experimental model by the Shaw-Box Div of Manning, Maxwell & Moore, may be controlled from the floor or may be equipped with the usual operator's cage. All-hydraulic drive provides infinitely variable speed under any load, and is reported to require less maintenance than multi-motored electric counterparts.

Power for each of the crane motions - hoist, trolley travel, and bridge travel - is supplied by a single Dudco constant-delivery, vane-type hydraulic pump driven by a 10-hp squirrel-cage single-speed motor. Pump has a capacity of 12 gpm and provides 2000 psi at 1200 rpm.

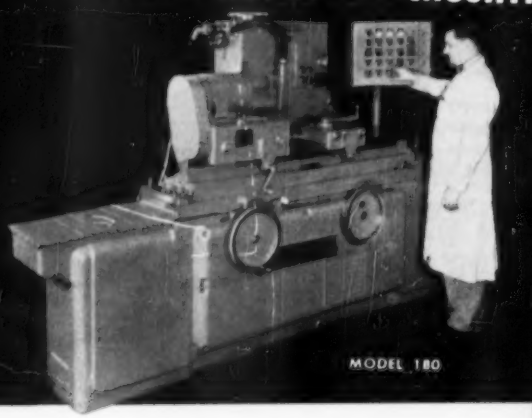
Although full-load speeds of crane are 175 fpm for the bridge, 100 fpm for the trolley, and 18 fpm for the hoist, any desired speed to suit individual requirements may be obtained.

Accompanying illustration shows view of trolley from below. Trolley rides two rails mounted inside bridge girder web. It is moved by two link chains running the full inside length of both bridge girders.

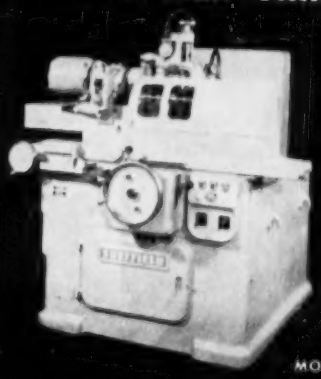
Shaw-Box Crane & Hoist Div, Manning, Maxwell & Moore, Inc, Muskegon, Mich

ADJUSTABLE STORAGE RACK in Sturdi-Bilt line can be used interchangeably for storage of pallets, skids, or bulk, or for combinations of stored materials. Unit is assembled without bolts, nuts, welding, or special labor. Racks are composed of three basic parts: upright frame, support beam, and floating wedge lock. To erect rack, support beams are connected at each end to upright frames by slipping wedge lock through any pair of slots in the upright, then through the slots in the support beam, applying pressure to lock it rigidly. Frame and support beam are available in various lengths—*Sturdi-Bilt Steel Products, Inc, 2501 Peterson Ave, Chicago 45, Ill*

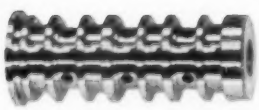
Grind PRECISION FORMS, GROOVES and LANDS *in Record Time* with SHEFFIELD'S CRUSHTRUE MULTIFORM GRINDERS

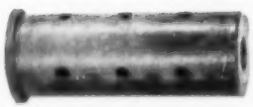


MODEL 180



MODEL 109





Servo Mechanism Sleeve

The seven grooves of this servo mechanism sleeve are crushtrue ground from the solid to a tolerance of .001" on spacing and .002" on minor diameter in 55 seconds. Material, SAE 52-100; Rockwell, 58-60 C; depth of plunge grind, .145".

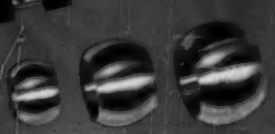
Forms and grooves are precision ground on these machines with comparable speed and economy.

For complete details write to Department 1, The Sheffield Corporation, Dayton 1, Ohio, U.S.A.

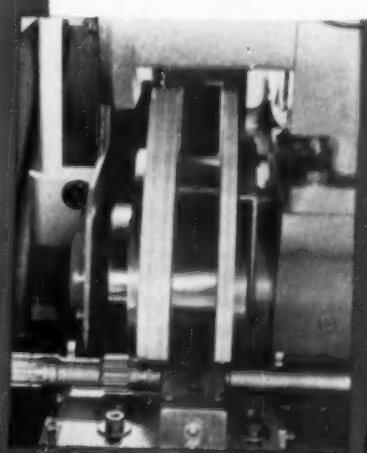
Bearing Race

Aircraft Servo Component

Hydraulic Servo Units



Self-aligning Bearings



Grinding Grooves in a Transmission Shaft

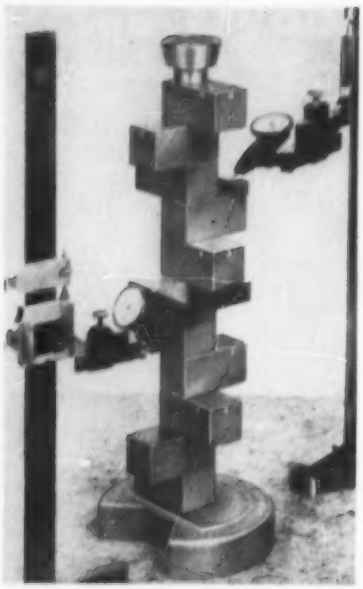
Crushtrue Roll

GOLDEN ANNIVERSARY

SHEFFIELD

manufacture and measurement for mankind

NEW SHOP EQUIPMENT, MATERIALS, AND PARTS



Stacked Gage Blocks Form Height Gage

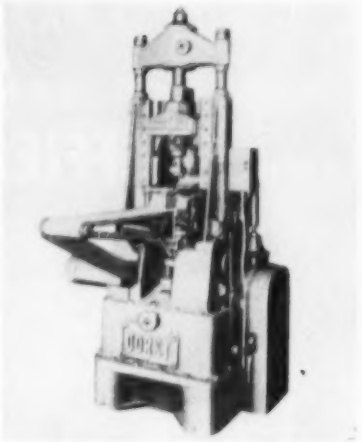
Inchmaster is designation for portable, lightweight unit constructed of a stack of individual gage blocks so arranged that portions of both the upper and lower surfaces of each block are exposed for quick and easy setups. Blocks are each of 1-in. thickness, so that full inches are directly available on the instrument.

Maker points out that one of the chief advantages of the instrument is that a number of different dimensions may be set up, so that several tools or components can be checked at the same time. Also featured is the heavy base, which prevents toppling over of blocks.

Orion Tool Co, 14560 Lesure, Detroit 27, Mich

Spherical roller bearings in sizes 240-mm OD and larger are now equipped with lubricating holes in the outer ring at no additional cost to the customer, according to report from SKF Industries. Design change provides for more efficient "center" rather than "side" lubrication of a bearing. Effect of having a flow of lubricant from the middle of the bearing toward the outside instead of from the sides toward the center is to flush out old lubricant and, with it, any dust, dirt, or moisture.

SKF Industries, Inc, Philadelphia 32, Penna

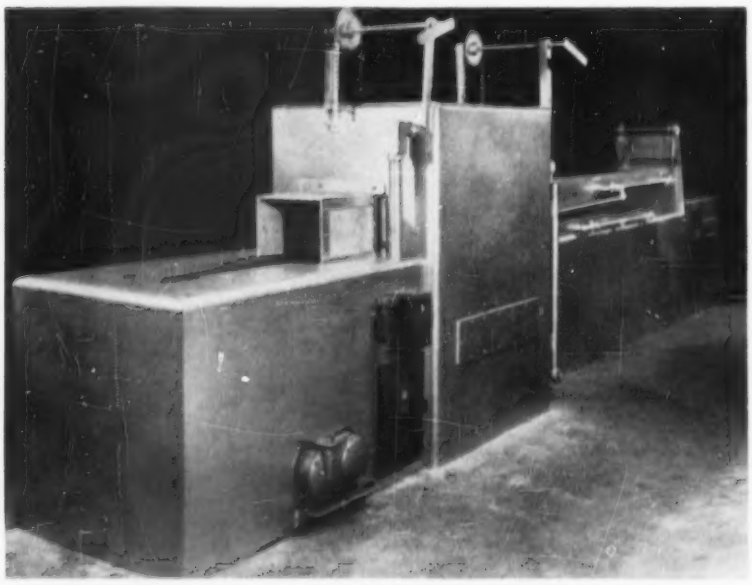


Powdered-Metal Press Available In 110-ton Model

Dorst powdered-metal press, imported from Germany, is offered in 110-ton model which incorporates design features in 50-ton model previously available. Press is reported capable of producing from 4 to 20 pieces per minute, depending on the intricacy of the part.

Features include adjustment controls with micro-meters for pre-press movements; automatic fill, press, and ejection of material; variable-speed drive, pick-up mechanism and conveyor belt to remove pressed parts automatically.

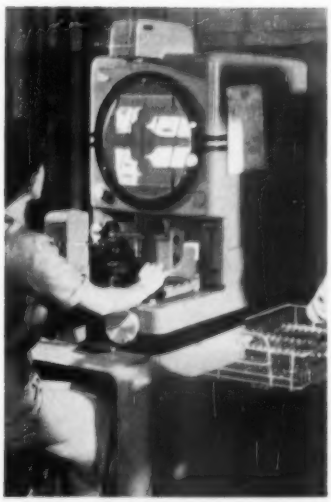
Imported by Arnhold Ceramics, Inc, 1 E 57th St, New York 22, NY



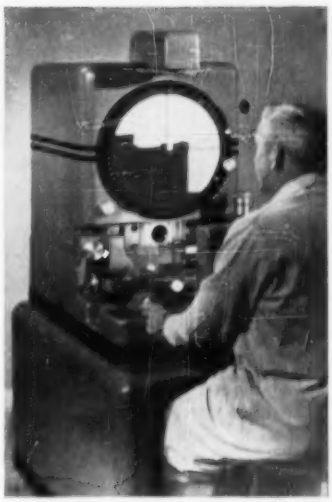
CONTINUOUS BRAZING AND SINTERING FURNACE in Waltz line, recently installed in Los Angeles, is mesh-belt type, globar heated for max temperature of 2300 F. Cooling chamber at the back is 2½ times the length of the heating chamber. Gas curtains are provided at the entrance door and at the exit end of the cooling chamber. Heating chamber is 12 in. wide by 8 in. high by 48 in. long. Furnace is heated by eight Globars mounted vertically, four on each side. Variable tap transformer (3-phase to 2-phase) has max input of 34 kw. Cooling chamber provides at least two in. of water around the inner section. Alloy belt is eight in. wide and is driven by a Reeves variable drive—*Waltz Furnace Co, Dept 1, Symmes St, Cincinnati, Ohio*

CAM-TYPE CLAMP in Jergens line is available in sizes from 1/4 to 5/8 in. Clamp utilizes an interchangeable pad of soft material which can be easily shaped to fit any work surface; pads are attached to the strap by two screws, and can be changed quickly. End slot is provided on clamp assembly to provide lateral adjustment—*Jergens Tool Specialty Co, 712 E 163rd St, Cleveland, Ohio*

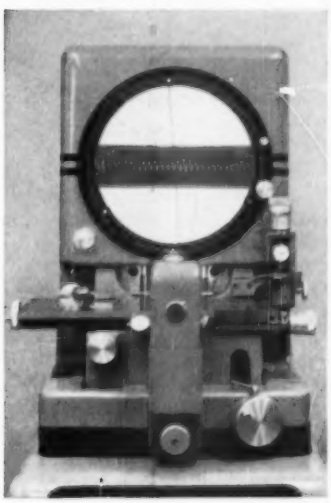
How many places in your plant can projection gaging save time and money?



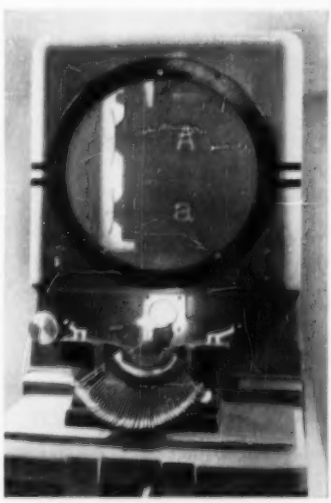
In the toolroom? Look at this. Prior to adopting projection gaging, a Midwestern manufacturing plant required 725 man-hours monthly to inspect flat drills, taps, special cutters, and circular form tools. Use of a Kodak Contour Projector reduced inspection time 84% to 115 man-hours; cost of the projector was returned in direct labor savings within three months. If you have a heavy inspection load in your toolroom, chances are that optical gaging with Kodak Contour Projectors could effect similar savings for you.



In receiving? Here's the experience of a leading maker of aircraft engines. Their gaging procedure on jet engine blades called for inspecting 11 dimensions (including radii and angles) on the dovetail contour, 14 additional dimensions on the blade root. Using two Kodak Contour Projectors, they checked these pieces at a rate of 150 per hour. And operators required little training. What about your receiving inspection department? Couldn't a fast, highly accurate method of inspecting all sorts of parts with multiple dimensions and complex shapes help prevent bottlenecks?



In production? A lot of people don't think of optical gaging in terms of production inspection. A typewriter maker did. To check the alignment of type bars to ±.0002", they placed a Kodak Contour Projector next to the soldering jigs on which bars are mounted on their arms. Catching errors at this point and correcting the jigs reduced alignment time in final assembly 25%. Install Kodak Contour Projectors next to production equipment and you have a fast, continuing check that insures machine settings are correct. That's a good way to keep scrap costs down and quality up.



In final inspection? Ever have a part that was almost impossible to inspect accurately and completely? A leading West Coast electronics manufacturer did. They had to check the precise pitch of a fine wire helix mounted in its glass tube. "Without the Kodak Contour Projector," the company reported, "it would not be practical to make the measurements necessary to get a satisfactory instrument." Many times optical gaging on a Kodak Contour Projector lets you measure small or easily distorted parts with a simplicity and accuracy you can't achieve by other methods.

WHATEVER your inspection or measuring problem, there's a Kodak Contour Projector to do the work, from the bench-type Model 8 to the big Model 30 with its 30-inch screen and large part capacity.

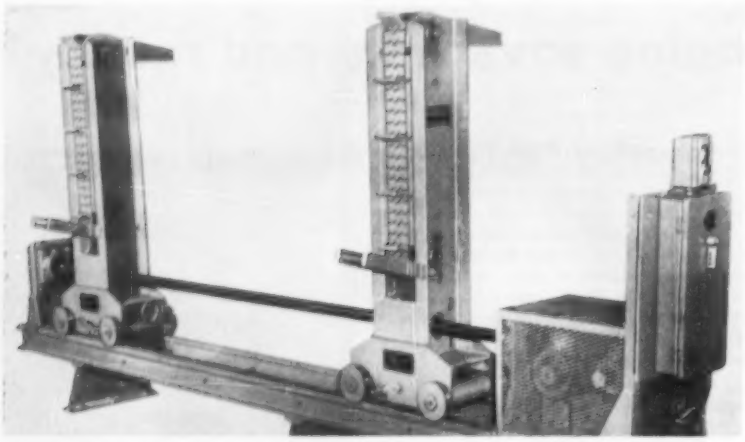
To find out more about how optical gaging can save you time and money, improve accuracy, send for the booklet, "Projection Gaging with Kodak Contour Projectors." Write *Special Products Sales Division.*

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

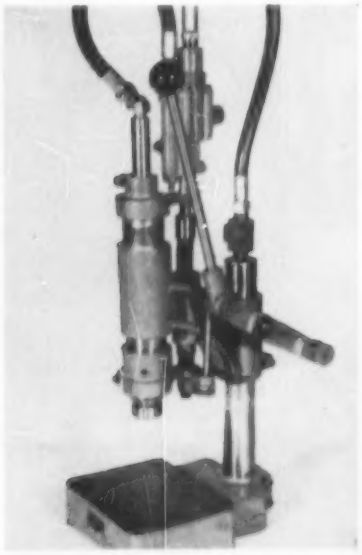
the KODAK CONTOUR PROJECTOR

Kodak
TRADE-MARK

NEW SHOP EQUIPMENT, MATERIALS, AND PARTS



BAR UNLOADER made by Feedall unloads pieces of bar or tubing from a production machine to a high tote box. Unit has one stationary tower and one movable elevator, so that it can be adjusted to handle pieces from 3 to 12 ft in length and from 1½ to 3 in. in diameter, at a variable rate of speed. In operation, bar or tubing flows from machine into a V-shaped trough which is tripped to one side as piece leaves machine. Piece falls down an incline until it is picked by the cleats of the two elevating conveyors, which operate in unison. Conveyors carry piece to top and over to other side, where it rolls into the tote box. Power is furnished by a ½-hp, 220/440v, 3-phase motor—*Feedall, Inc, Willoughby, Ohio*

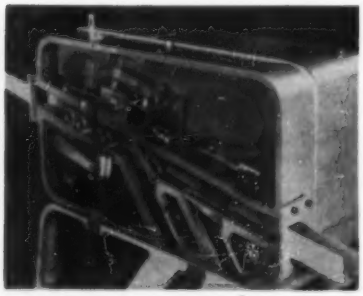


Pneumatic Impact Machine

Heidrich-Nourse Model 150-VS small pneumatic impact machine operates on constant air pressure, with impact regulated by adjustment of hammer movement inside the cylinder. Impact tool is chucked at the lower end of the hammer cylinder, and is brought into contact with the work by a mechanical traverse operated by a foot pedal. After contact an overtravel in the mechanism opens the hammer valve. Tool must be in contact before the hammer can be released; thus alignment of work under tool can be checked by contact.

Impact range of machine is from 0 to approximately 3000 lb at point of contact. Unit can be used for such operations as staking, crimping, riveting, force-assembling, and impression marking.

Heidrich-Nourse Co, 631 E Third St, Los Angeles 13, Calif

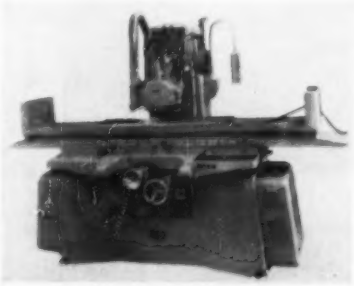


Gear Classifier Line Has Size Monitoring System

An automatic, probe-type, gear size monitoring system has been added to the 3-way gear classifier line offered by Michigan Tool Co. Oversize, undersize, and correct-size gears are monitored automatically, using the pitch diameter as a reference base. Model has a three-point contact system, composed of two lower stationary probes and one upper "floating" probe, that "senses" 100% gear production. Contact system distinguishes model from previous company models, which used master gears for gaging action.

In operation, gears enter classifier from the side and continue down the inclined ramp through the probe-sizing operation. Gears within tolerances continue through the classifier to the next operation. Any oversize or undersize gears are shunted aside. Geneva-type mechanism controls and times the probe movement as well as the escapement action that feeds gears to the probing station.

Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich



Hydraulic Surface Grinders

Blohm hydraulic surface grinders, imported from West Germany, are reported to have adjustment accuracy of 0.00004 in. "Microtip" infeed and depth-feed control gives automatic pushbutton depth feed of 0.00004 in. and cross feed of 0.0002 in. after a rough hand adjustment.

Illustrated Model HFS-12 has a grinding capacity of 14 in. wide by 48 in. long. Four other models range in capacity down to 14 x 18 in. Each model has a 5-hp, two-speed motor mounted directly on the spindle. Wheels up to 4 in. wide can be used in conjunction with a cross feed up to 2½ ips.

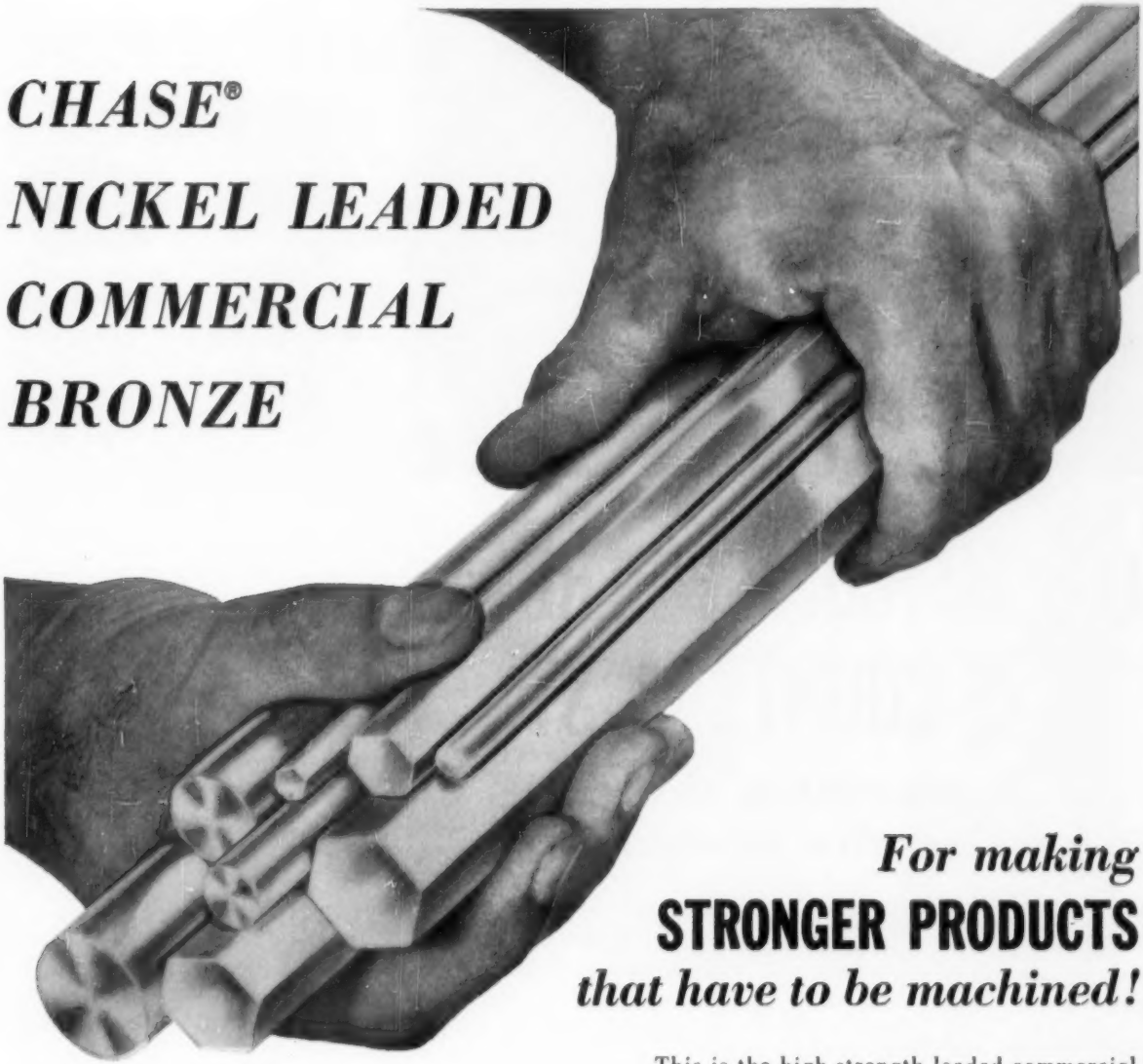
Models can also be furnished with an optional "Finimatic" device, which gives a completely automatic grinding cycle, with the machine stopping itself after three idle runs.

Imported by Aaron Machinery Co, Inc, 45 Crosby St, New York 12, NY

Planing and shaping tool, Type FH, makes possible external planing and shaping as well as internal grooving and slotting. Holder can be exchanged for extension bars which permit internal cutting work. Holder also features a swivel head with adjustable spring action.

Imported by B B Tool Co, Inc, 785 N Broadway, White Plains, NY

CHASE® NICKEL LEADED COMMERCIAL BRONZE



For making STRONGER PRODUCTS *that have to be machined!*

This is the high-strength leaded commercial bronze you have been looking for! It has *27 percent higher tensile strength, 20 percent higher yield strength* than Leaded Commercial Bronze, yet has a machinability rating that is 80% of that of Free-Cutting Brass.

Chase Nickel Leaded Commercial Bronze is a moderately priced alloy for making longer-lasting pole line hardware, electrical fasteners, nuts, bolts, and other bronze products that require added strength. Order Chase Nickel Leaded Commercial Bronze today. It's available in rod form—round sizes from ¼" to 1" diameter, hexagonal sizes from ¼" to ⅞".

"IN THE CHIPS"—a Chase movie showing Brass Rod and Wire *at work*. Every machine shop can benefit by showing it. Loaned free on request.

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Cut DIE COST WHERE IT COUNTS MOST...

...BEFORE the die gets in the toolroom

Nothing makes a diemaker meaner than a sticky punch holder. Count the number of times he removes that holder building up a die and it's foolish to save a few dollars buying second-rate die sets.

That can't happen with Detroit Die Sets because . . .

. . . **from start to finish, under one roof, Detroit Die Sets are continuously inspected for accuracy, whether it's turning a shank or superfinishing a guide pin. Misalignment doesn't have a chance.**

. . . **we are constantly working to improve our die sets. Recently developed ball bushings are an example. Extensive testing, in our own and customers' plants, has proven their value on certain applications. Now, they're available on Detroit Die Sets to extend production runs as well as making the diemaker's job an easier one.**

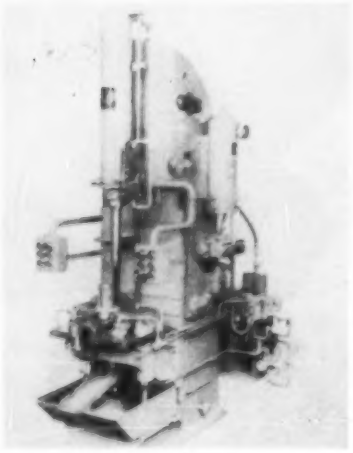
Details on the use of ball bushings plus other helpful information on cost-cutting Detroit Die Sets are available upon request. Write today, or see your local representative—he's as near as your phone.

Offices in Principal Industrial Centers

Detroit DIE SET CORPORATION

2895 WEST GRAND BOULEVARD • DETROIT 2, MICHIGAN

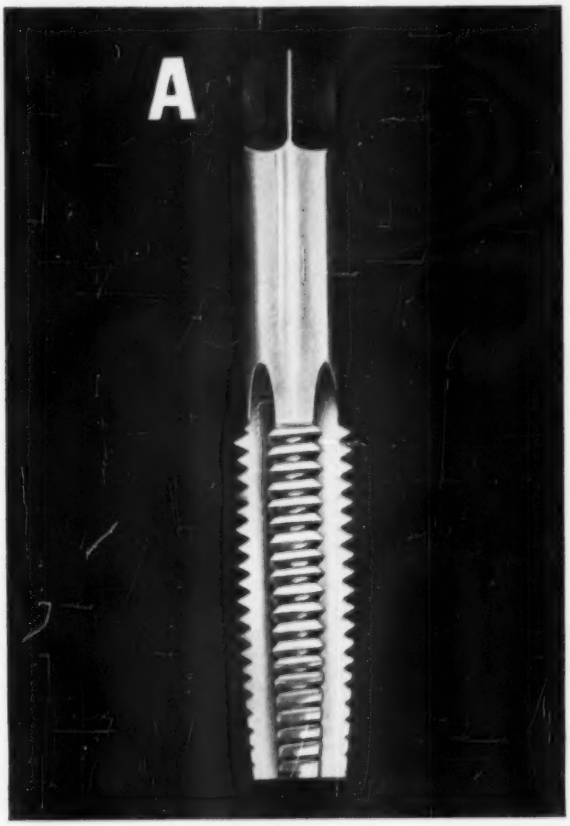
FOOT CONTROL for band machines with hydraulic table feed eliminates need for hand manipulation of feed and speed controls, also permits table to be stopped at any point. Controls table operation for straight production or contour sawing—*DoAll Co, 254 N Laurel Ave, Des Plaines Ill*

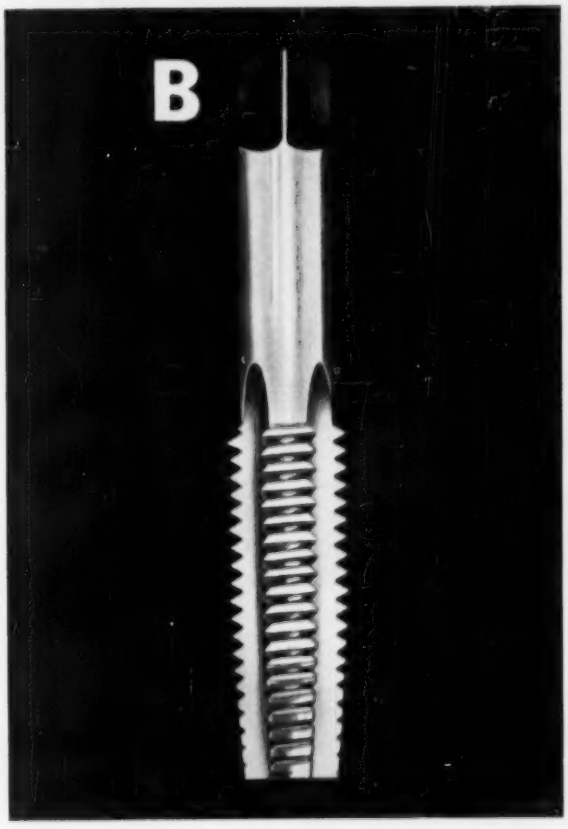


BRONZE AUTOMOTIVE SYNCHRONIZER RINGS are broached on American hydraulic Horning-type ,press which produces 300 parts per hr at 100% efficiency. Machine broaches 30 external involute gear teeth on the OD of ring in a continuous automatic cycle. Broaches are mounted in a stationary broach pot, through which the part is pushed. An air-operated automatic slide, interlocked to the machine cycle, carries parts from the tube feed to broaching position. Stripping fingers and an ejection device automatically strip and eject part below the pot—*American Broach & Machine Co, Ann Arbor, Mich*

(Continued on page 188)

WHICH OF THESE TAPS COULD NEVER GET PAST HY-PRO'S ELECTRONIC ANALYZER?





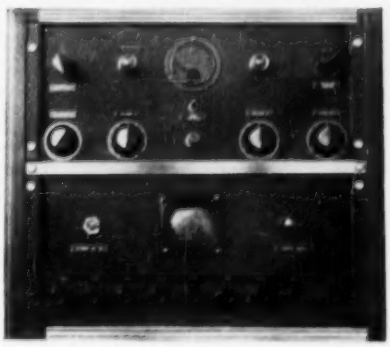
The serious defect in Tap B is invisible. But Hy-Pro's Electronic Analyzer detects all structural flaws for your protection.

HY-PRO'S amazing new Electronic Analyzer is one of the three important steps which Hy-Pro takes to insure you of *3-way Quality Control*. These three steps are the Electronic Analyzer, advanced Heat Treating and the Micro-Hardness Tester.

Here's how the Electronic Analyzer works. A standard tap, perfect in every detail, is put in one side of the machine. The tap to be tested is put in the other side. Electronic impulses are shot through both taps and every inch of each tap is tested as to composition, surface condition and internal structure.

The Hy-Pro Electronic Analyzer reveals every defect, including those that laboratory, production tapping and destructive tests fail to uncover!

The best part of the Hy-Pro story is that you get the benefit of these new Hy-Pro developments at no extra cost to you. Get in touch with your nearest Hy-Pro distributor or call us direct. Hy-Pro *quality-controlled* taps—products of the Tap Specialists—cost no more than ordinary taps.



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HY-PRO

"The Tap Specialists"

New Bedford, Massachusetts, U. S. A.

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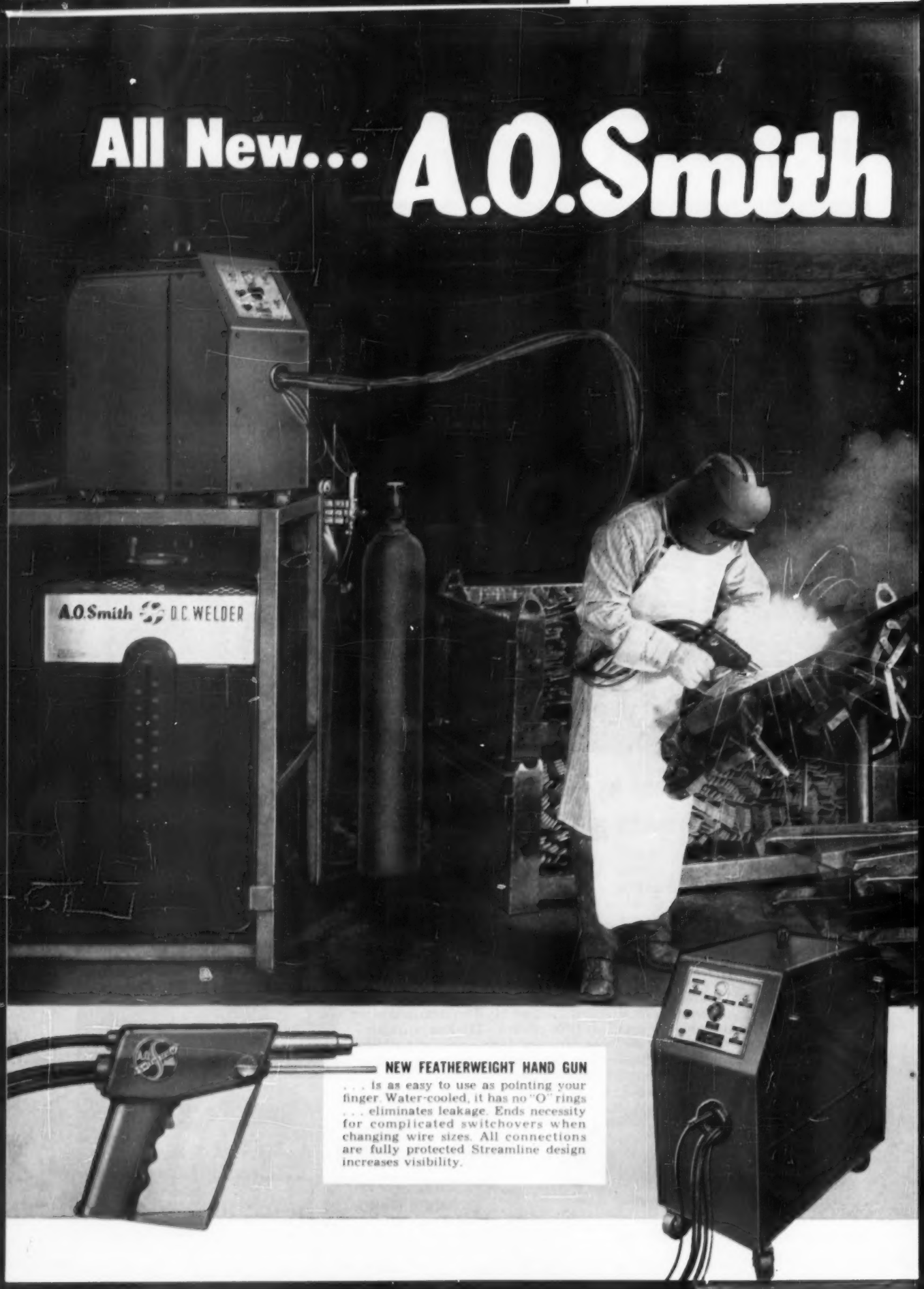
2895 WEST GRAND BOULEVARD • DETROIT 2, MICHIGAN

All New... A.O.Smith



NEW FEATHERWEIGHT HAND GUN

. . . is as easy to use as pointing your finger. Water-cooled, it has no "O" rings . . . eliminates leakage. Ends necessity for complicated switchovers when changing wire sizes. All connections are fully protected Streamline design increases visibility.

C-OMANUAL

Carbon Dioxide Hand Gun Welding

...offers amazing economy and high degree of automation!

★ **Cuts gas cost to practically nothing!**

1¢ per cubic foot for carbon dioxide as compared to almost 7¢ for Helium and 9¢ for Argon... and you use much less. Savings in gas alone will more than pay for your C-OMANUAL unit in several months.

★ **Clean slag-free welds!**

No flux to clean, no chipping, no scraping.

★ **Fast, fast, fast!**

Several times faster than the fastest stick electrodes... as fast, or faster than any semi-automatic process in existence.

★ **Visible arc**

Keeps you in the groove... assures consistent weld quality. Speeds spotting of nozzle.

★ **New simplicity of operation**

There's no constant fiddling with settings. Console automatically controls arc length... compensates for operator's arc distance variations.

★ **Deeper penetration**

Assures sound, uniform welds with excellent strength and ductility.

SEEING IS BELIEVING — Try C-OMANUAL yourself at the AWS Show, A. O. Smith Booth No. 90. For complete facts and information on availability, contact your man from A. O. Smith.

COMPACT, EASILY PORTABLE CONTROL CONSOLE

Mounted on free-rolling rubber casters, the control console is easy to move from spot to spot. It contains wire reel, feed and speed controls, easily traced electrical circuits and all gas and water connections — *plus the exclusive two-speed head* which allows operator to get proper feeds for light or heavy wire by mere flick of selector switch. Controls on front panel are conveniently grouped, easy to read.

Through research ... *a better way*

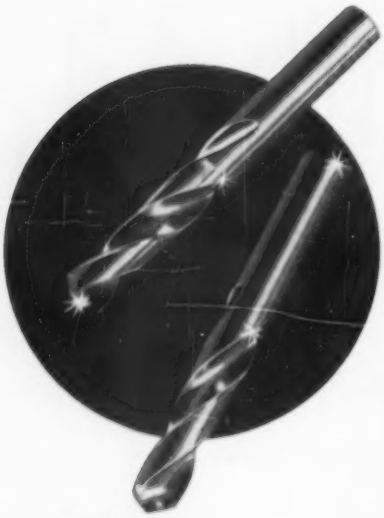
A.O.Smith

CORPORATION

WELDING PRODUCTS DIVISION

Milwaukee 1, Wisconsin

INTERNATIONAL DIVISION: Milwaukee 1, Wis.



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A PRICE THAT'S RIGHT, GET

ACE
STUB DRILLS

Fact is, drills just don't come any tougher than Ace Stub Drills. Their short, heavy duty flutes are precision ground into a solid, continuously hardened bar of top grade high speed steel. This special Ace-originated process makes possible a finer finish, plus keener cutting lips and extra strength . . . results in less wear and breakage, longer drill life. As for versatility, Ace Stub Drills are designed for close-to-work screw machine operations and they're ideal, too, for portable drilling. They're stocked in over 130 standard sizes to meet your particular requirements, and they cost *approximately 20% less* than equivalent jobber length drills! Call your local Ace Distributor the next time you need drills . . . or send for complete information today!

ACE DRILL CORPORATION
Adrian, Michigan

Gentlemen: Please send me your Catalog No. 52-A containing complete information on ACE "Ground-from-the-Solid" Drills and hardened H.S.S. drill blanks.

NAME _____

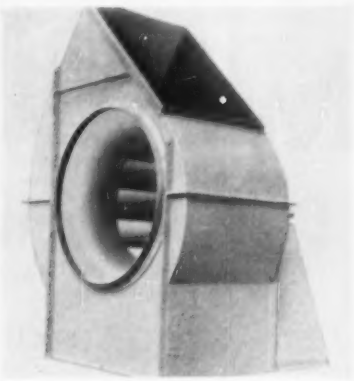
COMPANY _____

ADDRESS _____

CITY _____ STATE _____

ACE DRILL
ADRIAN, MICHIGAN
ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

NEW SHOP EQUIPMENT



Chicago Centrifugal Fans

Fans are designed for wide range of ventilating, air conditioning, and heating applications, wherever Class I or Class II meet the requirement.

Type B has a backward-curved, flat-bladed wheel with non-overloading characteristics. Type F has a forward-curved, multibladed wheel for slow speed operation. Both are available with direct or V-belt drive. Units are claimed to be particularly applicable to handling of hot air and gases up to 600 F. Wheel diameters are from 12¼ to 143 in. Specifications: Type B, volumes up to 324960 cfm, pressures to 6½-in. sp; Type F, up to 277400 cfm, pressures to 5-in. sp.

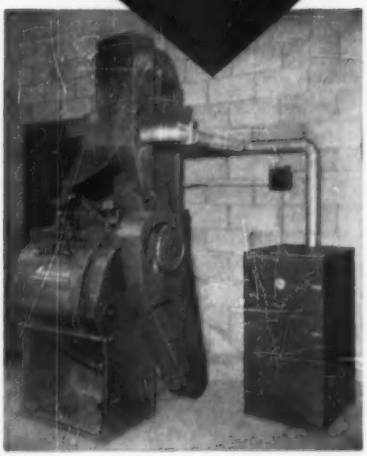
Details covered in bulletin C-102. *Chicago Blower Corp, 9869 Pacific Ave, Franklin Park, Ill*

Liquid Spring

Liqui Spring-Shok, using liquid compressibility, is a combination spring and built-in shock absorber. It incorporates an integral hydraulic levering principle which permits development of spring forces as low as 600 lb with a 2-in. stroke plus energy absorption as a shock absorber. Wide extremes of spring force are said to be possible with the same components while maintaining sturdy piston members of any desired rigidity.

Unit is 7⅜ in. long by 1⅜ in. in diameter, plus mounting stud. It delivers 8000 lb of spring force with a 1300-lb preload with a 1-in. stroke; according to manufacturer, it equals the combination of two 8-in.-dia springs 7 in. long of 1-in.-dia wire,

how to trap dust
that damages your machines and hurts company morale



Priced from $190.00

easy-to-move
TORIT DUST COLLECTORS
trap dust at its source!

Untrapped dust costs you money, "secretly" forces precision machines out of line, limits production. Torit dust collectors are unitized for custom installation—save more money, usually more efficient than central (built-into-the-building) system. Torit unit operates only when machine or combination of machines it protects are in use. Filtered air may be returned to room to save heat. Many models and sizes, all self-contained, easy to move. Write today to . . .

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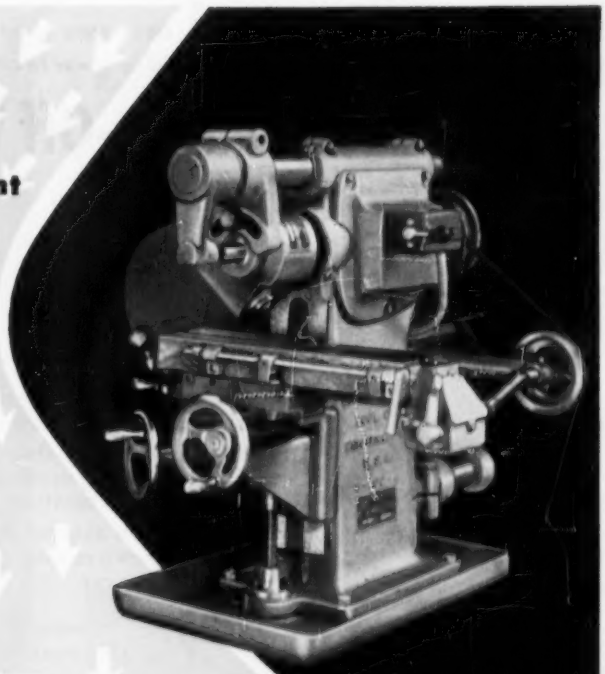
Dept. 406
311 Walnut Street
St. Paul 2, Minn.

Small parts bottlenecks strangling your milling department

?



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MILLING MACHINES

Free Big Mills for Big Jobs!

No. 1 U. S. MILLING MACHINE

The top-quality precision mill, economically priced! May be hand operated, or equipped with air-hydraulic feeds for high production applications.

This accurate and simple-to-operate mill brings small part production into balance, with low-cost operation that avoids wasted time and investment in big mills.

Excellent for keyways, quantity runs of small pieces, such as sectors, short racks, simple profiling, sawing, slotting, squaring, cut-off, short-run splining, even light slab milling.

BURKE BENCH MILLERS

Here's small part milling accuracy for either toolroom or production uses. Choose between 2 hand and 2 power feed models.

Rugged frame, hand scraped thruout, Timken bearings . . . in a time-tested design that provides accurate milling, drilling, sawing, boring, facing and slotting of small parts.

Wide range of speeds handles any material. Dependable performance and ease of set-up lower operational costs on all types of small parts. Vertical Milling Attachment and complete range of other accessories available.

Write for complete specifications and prices

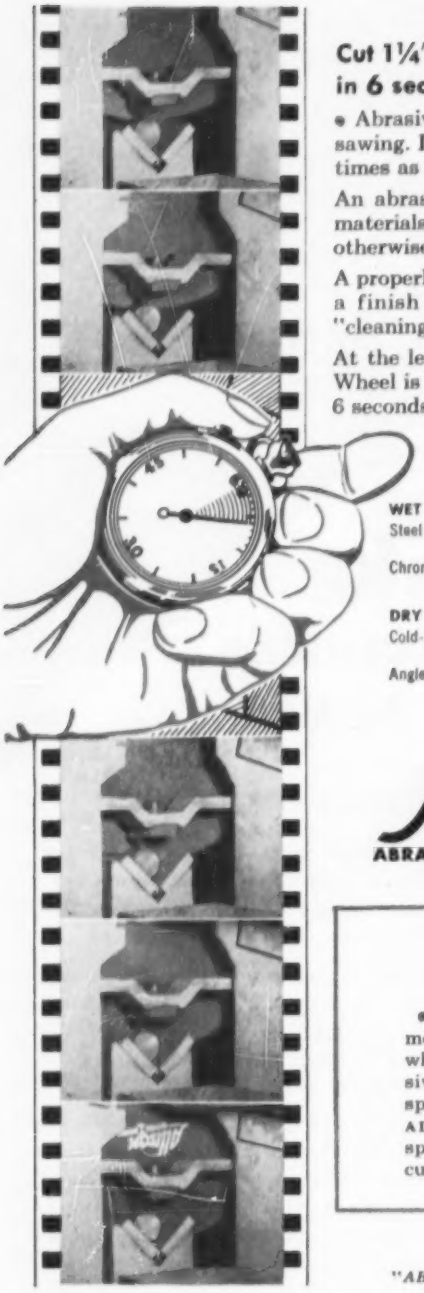
U·S·Burke MACHINE TOOL DIVISION
6 Brotherton Road ● Cincinnati 27, Ohio

Manufacturers of the U. S. Vertical Milling Machine and the radically new U. S. Quartet

Abrasive Cutting

the best way to cut many materials
the only way to cut some

Allison Cut-Off Wheels



Cut 1¼" Bar Stock in 6 seconds

• Abrasive wheel cutting is faster than sawing. In many cases it is ten to twenty times as fast.

An abrasive wheel will cut the hardest materials with ease. No need to anneal or otherwise prepare material for cutting.

A properly selected abrasive wheel leaves a finish which requires little, if any, "cleaning-up" operation.

At the left an ALLISON Abrasive Cutting Wheel is shown cutting 1¼" bar stock in 6 seconds per cut.

HOW'S THIS FOR PERFORMANCE?

	Cutting Time
WET CUTTING	
Steel Bar.....8" dia... Rotary-type machine....	320 seconds
Chrome Steel Bar.....4" dia... Oscillating-type machine..	105 seconds
DRY CUTTING	
Cold-rolled Steel Bar..1" dia... Chop Stroke-type machine..	2 seconds
Angle Iron.....1" x 1" x ⅛".. Chop Stroke-type machine..	2 seconds

Allison
ABRASIVE CUTTING WHEELS

It pays to consult a specialist

• Profitable abrasive cutting means using the right abrasive wheel...and the proper abrasive cut-off machine...for the specific job. Why not let an ALLISON abrasive cutting specialist check your hardest cutting job?

Send for Booklet "ABRASIVE CUTTING" today

ACCO

ALLISON DIVISION
AMERICAN CHAIN & CABLE

254-A Island Brook Avenue, Bridgeport 8, Conn.

plus two standard automobile shock absorbers each of the same diameter as the Liqui Spring-Shok.

Taylor Devices Inc, 188 Main St, North Tonawanda, NY

All-Purpose Spray Gun

Model P-CGA, said to be low in cost and relatively lightweight, can be used where a limited amount of compressed air is available.

Gun can be quickly converted with the flick of a knob from a suction-feed unit to a pressure-feed type for spraying all commonly used materials. Suction feed is used for light-bodied materials, such as lacquer or spray wax. In spraying primer surfaces or other heavy-bodied materials, pressure-feed setting is said to avoid starved patterns and assure full, heavy spray pattern for well covering coats. Unit, equipped with a 1-qt metal cup, is claimed to produce good spray painting results even when operated from a compressor of ¼ hp.

DeVilbiss Co, 300 Phillips Ave, Toldeo 1, Ohio

Air-Operated Automatic Drills Have 5-Step Work Cycle

Work cycle is initiated by pressing a button. Motor starts, drill traverses rapidly to the work, feeds at preset rate while drilling hole, then retracts and shuts off when hole is completed. Units can be used singly or in mul-

(Continued on page 194)

ONE OF A SERIES . . .

What makes a cylindrical roller bearing good?

The RIGHT ROLLER DESIGN and QUALITY CONTROL

The design and quality of the *rollers* play a large part in the performance of a cylindrical roller bearing. At right are some of the vital factors which must be considered.

All these factors are scrupulously controlled by the most modern precision equipment to insure maximum performance and life for every HYATT Roller Bearing. You'll find more details in HYATT General Catalog No. 150, or your nearby HYATT Sales Engineer will gladly help you choose the type best suited to your requirements. Remember, HYATT is America's *first* and *foremost* maker of cylindrical roller bearings. Hyatt Bearings Division of General Motors, Harrison, New Jersey.

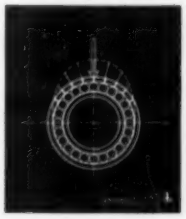
GM GENERAL MOTORS

HYATT

ROLLER BEARINGS

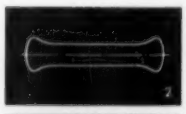
1. DISTRIBUTION OF LOAD WITHIN THE BEARING

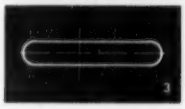
Rollers are subjected to load only while in the "load zone," with maximum load while on the line of action of the bearing load, as shown in diagram 1. The theoretically perfect "load zone" extends from −90° to +90° from the line of action, but this is neither practical nor necessarily desirable. Under normal loadings, the actual "load zone" may range from 90° to 120°, depending on load and mounted internal clearance. This distributes the load so the load on the heaviest-loaded roller is approximately 5/N times the bearing load, where N is number of rollers.



2. DISTRIBUTION OF LOAD WITHIN ROLLER'S AREA OF CONTACT

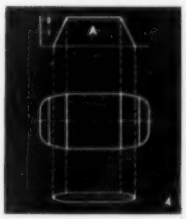
A cylinder deflects locally in the region of engagement when loaded between flat plates. The plate also deflects, so the original line of engagement is broadened into a "dog-boned" area under load, as shown in diagram 2. Moreover, deflected cylinders must gather in metal at their ends in *two planes, and this end-loading effect can seriously reduce the life of a cylindrical roller bearing.* All HYATT rollers have generous corner radii or blended chamfers to reduce end effect; and all HYATT Hy-Load rollers also have crowning to allow the contact area to "fade out" evenly (diagram 3).





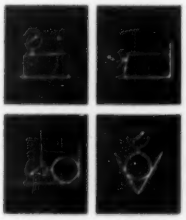
3. DISTRIBUTION OF LOAD ACROSS ROLLER

The unit load on any roller is uniformly distributed axially except at the crowned ends where it drops off to zero as shown in diagram 4. The summation of unit loads represented by area A is the total roller load. This same load under misalignment results in an area equal to area A; but maximum unit load is considerably greater and the bearing will have a shorter life than a properly aligned one. When the same total load is applied to an *uncrowned* roller, an even higher unit load results. This demonstrates the value of crowning when misalignment occurs.



4. EFFECT OF ROLLER QUALITY ON BEARING PERFORMANCE

Lack of roller quality control has a very adverse effect on performance: 1. A roller with excessive *taper* tends to uneven load distribution and abnormal temperature rise. 2. A roller with excessive *end square* tends to noisy bearing performance. 3. A roller with excessive *two-point out-of-round* tends to poor segregation and poor bearing life. 4. A roller with excessive *three-point out-of-round* tends to noisy bearing operation. 5. A roller with *poor finish* tends to wear on all operating surfaces and noisy operation. 6. A bearing with excessive *roller-to-roller diameter variation* tends to poor bearing life. 7. A bearing with excessive *roller-to-roller length variation* tends to poor thrust capacity, abnormal temperature rise.



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. . . EXAMINE THESE REASONS

why leading extruders use

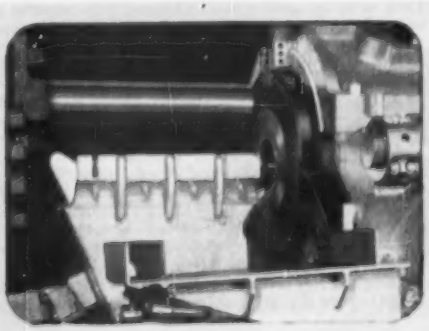
LAKE ERIE PRESSES

EXPERIENCE AND REPUTATION

Lake Erie Engineering Corporation is recognized throughout the world as the only volume designer and builder of hydraulic presses, die casting machines, and extrusion presses as well. Rugged, low stressed construction, dependable operation, incorporation of latest design features—all have become the hallmark of Lake Erie equipment. As a result of its research and development efforts, Lake Erie built the first presses for the commercial cold extrusion of steel and pioneered in the development of one of the first U. S. presses for the hot extrusion of steel.

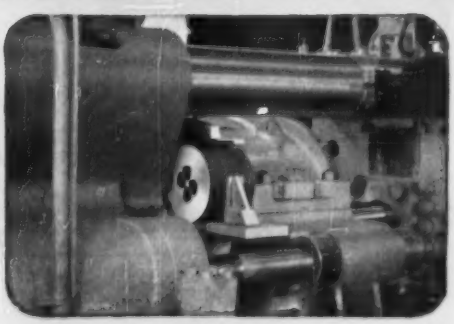
PRESS FEATURES

Container holder, designed to maintain alignment regardless of thermal expansion, gives longer tool life and higher quality extrusions. Billet loader, mounted on container holder, saves time by permitting loading cycle to start while previous billet is being extruded. Rotary die slide speeds die changing and provides clear view through die for inspection and cleaning. Automatic cycling cuts non-extrusion time. Other beneficial features include runout opening machined for carbon canister, sufficient container length and stroke to accommodate bridge-type porthole dies using full-length billets, an independent loader finger, and safety interlocks.

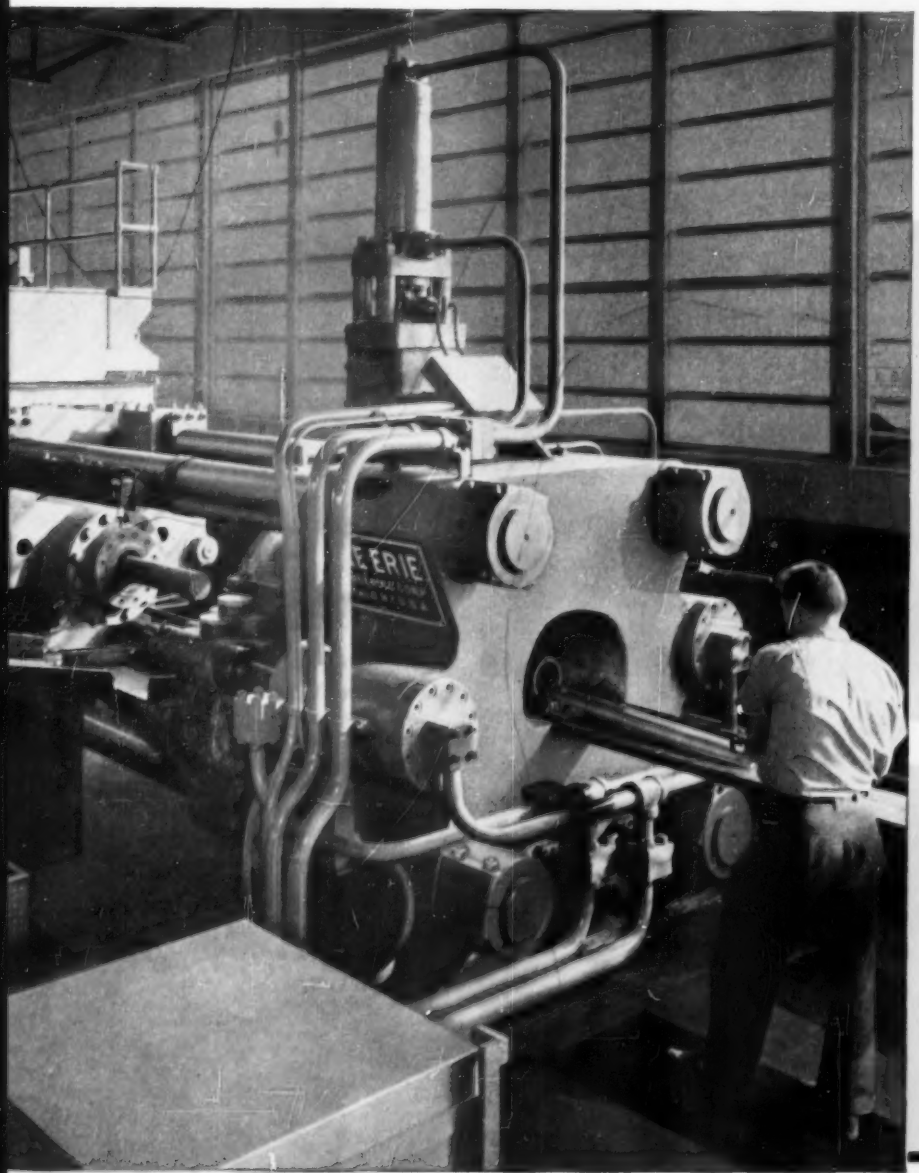


← Billet Loader, mounted on container holder, speeds loading.

→ Patented Rotary Die Slide speeds die changing, simplifies inspection and cleaning.



in EXTRUSION equipment



RESPONSIBILITY AND SERVICE

Your Lake Erie press will be assembled and fully tested in our shop. Our service organization will install, start up and test the equipment in your plant, and instruct your personnel. The most complete operations and maintenance handbook will be furnished. And, if you wish, we will arrange for the complete installation including stretchers, billet heaters, conveyors and other related equipment.

TYPICAL USERS

who have bought from one to five Lake Erie presses:

Allegheny Ludlum Steel Corp.
Harvey Aluminum Co.
Hunter-Douglas Aluminum Corp.
Hokin Aluminum Co.
Bohn Aluminum & Brass Corp.
Ludman Corp.
Macklanburg-Duncan Co.
Reynolds Metals Co.
Revere Copper & Brass, Inc.
Texas Aluminum Co.

● A 1400 ton aluminum extrusion press and complete auxiliary equipment recently installed by Lake Erie for Stanley Building Specialties Company.

LAKE ERIE
ENGINEERING CORP.
BUFFALO, N.Y. U.S.A.

LAKE ERIE ENGINEERING CORP.

General Offices and Plant: 507 Woodward Ave., Buffalo 17, N. Y.
District Offices in New York, Chicago, Detroit, Pittsburgh
Representatives in Other U. S. Cities and Foreign Countries

LAKE ERIE®

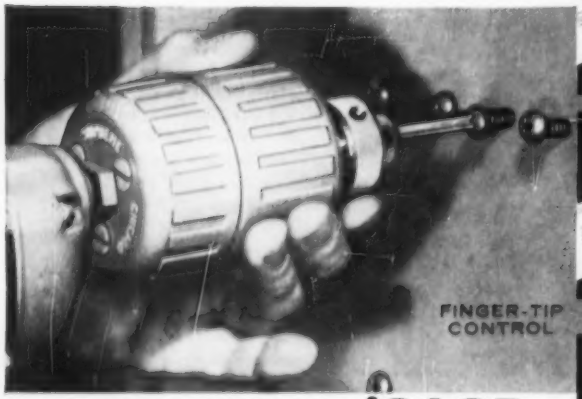
Manufacturers of die casting machines and the most complete line of hydraulic presses for all industry

Greatest new tool in years for maintenance and production

a high quality, low cost
REVERSIBLE
SPEED REDUCER

Fits all portable drills . . . reduces speed, increases torque seven times. Ask your distributors to show you the . . .

Supreme Versamatic
PROFESSIONAL MODEL
No. 4000-P



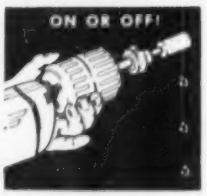
COMPLETE 14-PIECE SET . . . ONLY $24.95

Engineered and manufactured by the makers of

Supreme Chucks
BRAND

The line that's UP FRONT on America's leading power tools

SUPREME PRODUCTS, INC., 2222 S. CALUMET, CHICAGO, ILLINOIS

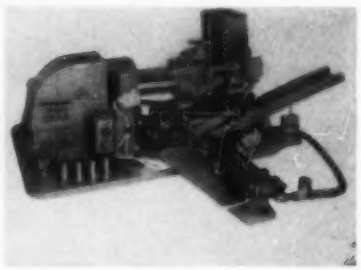


NEW SHOP EQUIPMENT

tiples, may be bench-mounted, suspended, or locked to drill jigs.

Drills are available in a range of 15 models and five speeds for processing metals from thin sheets up to 6-in. alloy steels. They can be furnished with 2, 4, or 6-in. stroke lengths; speeds of 4600, 2500, 1200, 650, and 350 rpm; drilling capacity from ¼ to ½ in. in mild steel, 5/16 to ½ in. in aluminum or brass.

Aro Equipment Corp, Bryan, Ohio



AUTOMATIC MOTOR-DRIVEN MARKING MACHINE features a jet of air to position work and then to eject it after marking. Designated Acromark Model 9AAA, machine has a 7-in. stroke and will mark parts up to 2-in. diameter in the standard machine, or larger when the oversize frame is used. Standard operating speed is 36 strokes per minute. Acrojet assembly moves each part forward into marking position from conveyor, then ejects marked part into another conveyor and automatically positions the next part. Dimensions are 26 in. long by 30 in. deep and 18 in. high—*Acromark Co, 2-13 Morrell St, Elizabeth 4, NJ*

Pneumatic Noise Attenuator

Series 4-44 Atomuffler in Allied Witan Co line is reported to elimin-

NEW

No. 3-36 . . . 36" table travel . . . 24" x 10" table . . . full automatic hydraulic feed.

No. 3-36
HYDRAULIC MILLING MACHINE

Now—the family of Kent-Owens Milling Machines has expanded to give you the same unexcelled milling accuracy, speed and dependability for *larger size work!*

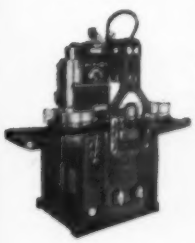
Proudly we present the No. 3-36 Hydraulic Milling Machine . . . the new "big brother" in the line of popular Kent-Owens Millers. Each Kent-Owens machine is ruggedly designed with advanced features throughout for greater dependability and accuracy to maintain tough production schedules. Write for bulletin 955 on wide range of hydraulic and hand-operated machines. Also, let Kent-Owens design and build your tooling and special machines.

Kent-Owens Machine Co., Toledo, O.

Simple . . .
Rugged . . . Efficient

No. 2-20DS . . . Double Spindle for two milling operations . . . 20" table travel . . . 42" x 12" table. Hydraulic feed.

No. 1-14 . . . 14" table travel . . . 32" x 9" table . . . hydraulic table feed . . . full automatic cycle.



No. 2-20 . . . 20" table travel . . . 42" x 12" table . . . full automatic hydraulic feed.

No. 1-M . . . Hand feed to table and head . . . 25" x 9" table . . . 12" table travel . . . head counter-balance is adjustable.

Call on

KENT-OWENS
for MILLING MACHINES

KENT-OWENS REPRESENTATIVES

SHIMS

BRING YOUR SHIM PROBLEMS TO EXPERIENCED SPECIALISTS

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Only LAMINATED SHIM COMPANY Offers These Efficient, Economical Solutions:

THE LAMINUM® SHIM

SIMPLY PEELS FOR ADJUSTMENT

Made up of from 3 to 63 layers of .002 or .003 inch brass or steel, metallically bonded together over their entire surfaces. No dirt between layers. Peels with penknife.

THE LAMISOL® SHIM

FOR QUICK, ASSEMBLY LINE USE

The laminations of the LAMISOL® Shim (in brass) are temporarily joined by spot-soldering on the edges. Gauges and number of laminations within one shim are unlimited.

PACKAGED SHIM STOCK

READY FOR EASY USE, WITHOUT WASTE

Thin gauge 6" x 100" rolls feed through package slots. Heavier gauges in flat envelopes. Available from your Industrial Distributor.

LAMINUM® and LAMISOL® Shims are also made of ALUMINUM; layers are .003".

FLASH! *LAMINUM® now available in STAINLESS STEEL with layers of .002" or .003".*

LAMINATED SHIM COMPANY, INC.

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Check Our Stampings Division For Your Stamped Parts Requirements

MAIL TODAY!

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3104 UNION STREET, GLENBROOK, CONN.

Please send me more information on:

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☐ We'd like to discuss our problem with one of your Sales Engineers.

NAME _____ TITLE _____

COMPANY _____

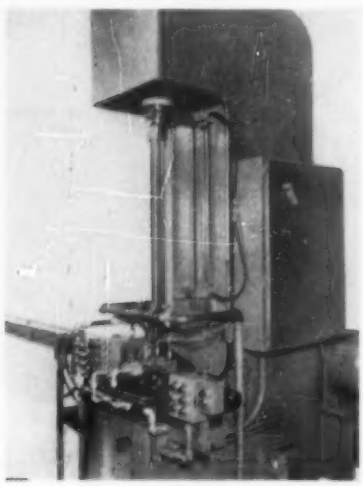
STREET _____

CITY _____ ZONE _____ STATE _____

ate almost all objectionable exhaust noise of air-operated equipment, when connected to the exhaust port of the equipment

Model, reported to be compact, inexpensive, and easy to install, is available in eight pipe sizes ranging from 1/8 to 2-in. NPT. Units are made with a male pipe thread for direct connection to air-operated equipment.

Allied Witan Co, Box 2770, Cleveland 11, Ohio

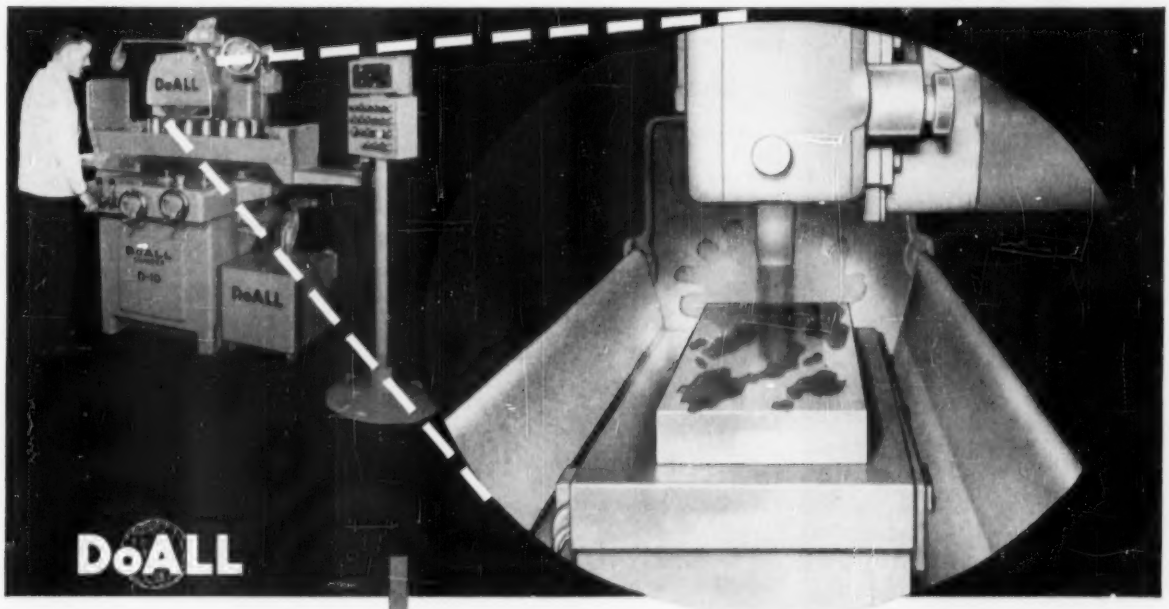


CAM SPRAGS for use in automotive industry are automatically broached in 24 different sizes from two sizes of steel cam section rod on Colonial Model PB press. Rate of production is 1000 per hour on special 10-ton, 42-in.-stroke machine. Four rods are fed at a time and a single pass of the broach completes four pieces. Length of parts varies from ½ to 1⅜ in. and is held within 0.005 in. tolerance—*Colonial Broach & Machine Co, Box 37, Harper Station, Detroit 13, Mich*

Rampe Barrel Finisher

Model V-8 barrel finishing machine is made in interchangeable combina-

"Cool Grinding" Proves 1000 Times More Effective than Flood Cooling



Grind Faster, Grind Accurately, More Confidently

Atomized coolant, as shown at left, is 1000 times more effective as a heat absorbent than liquid coolant. "Cool Grinding" puts this atomized coolant directly at the point of work-wheel contact. Temperatures are reduced as much as 1300°F as compared to flood cooling.

Aids Precision in Grinding—Efficient heat dissipation prevents expansion—helps assure close control of dimension and parallelism.

Ground Parts Last Longer—"Cool Grinding" eliminates burning, checking and stresses—a source of premature failure of ground parts resulting from high heats and quick quenching.

Increased Production—Grinding can be done at faster rates, without heat expansion or damage.

Dry Grinding Visibility—Mist does not obscure work, visibility is unlimited.

Wheel Life Increased—Continuous flushing and cooling action *in* the wheel greatly increases its life.

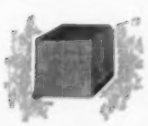
Standard Grinding Wheels—No need for wheels with "special" arbor holes.

Coolant Recirculates—Saves on coolant. Special filter cleans the coolant before reuse.

Free In-Your-Plant Demonstration—DoALL will bring a grinder to your plant and show you how to increase your grinding profits. Write: **The DoALL Company, Des Plaines, Illinois**

Mist Provides 1000 Times More Heat Absorbing Surface

A cubic inch of coolant offers six square inches of heat absorbing surface.



Atomized, each of the 1,000,000,000 cubes offers .000006 square inches of surface or total of 6,000 square inches over all.

In "COOL GRINDING" coolant is fed to the sides of the wheel. Centrifugal pump action draws the coolant into and through the wheel. It emerges atomized, right at cutting edge.

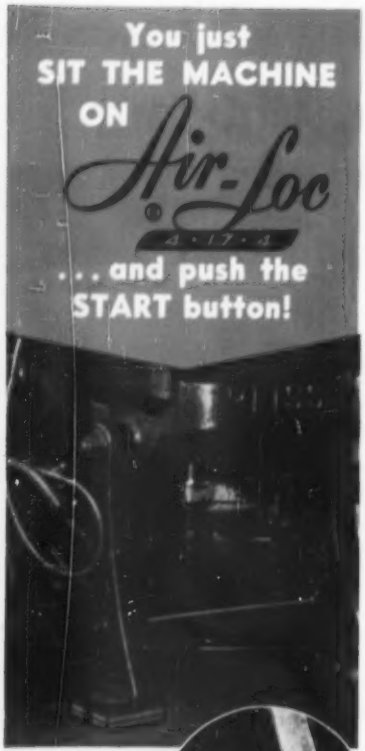
FREE MOVIES—Sound and color to show you the ultimate in precision grinding. Call DoALL locally or write.

FREE CATALOG—Shows design and construction of DoALL Grinders and accessories including "Cool Grinding".

Friendly DoALL Sales-Service Stores In 38 Cities.

Cool Grinding U.S. Pat. No. 2470350

GE-17



NO. 21 BLISS PRESS installed on AIR-LOC pads without cement, bolts or lag screws. Press has been banging out production for one year without "walking."

IT'S THAT EASY . . . NO CEMENT TO APPLY . . . NO WAITING FOR IT TO DRY . . . NO BOLTS OR LAG SCREWS.

You just sit machines on AIR-LOC and the installation is complete. Installation and "waiting time" (for cement to dry) are cut in half. Costs for installation are the lowest known in industry today.

NOTE: *The AIR-LOC method sounds so easy that some people don't believe it works. To make your own savings on machine installation, ask us for prices to cover one lathe, planer, press, etc. Put one machine on AIR-LOC and judge for yourself.*

Every order is shipped same day received.

FREE BOOK TELLS ALL

AIR-LOC Division
Clark, Cutler, McDermott Co.
Franklin Mass.

Please send the booklet describing patented AIR-LOC to:

NAME (PLEASE PRINT)

COMPANY

ADDRESS

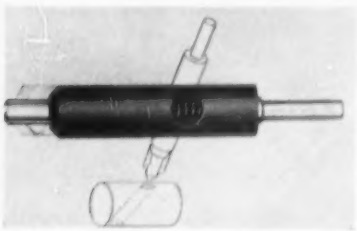
CITY ZONE STATE

NEW SHOP EQUIPMENT

tions of barrels, of 2, 4, 6, or 8 cu ft capacity. Total capacity for any combination is 8 cu ft. Power drive is by direct gears, with no chains or sprockets. Safety gate in front of machine provides protection all around unit.

Power is furnished by a 1½-hp magnetic-brake motor with jogging and reverse switch. Other features: variable-speed drive, waterproof start-stop switch mounted in front panel, and anti-friction bearings. Barrels can be furnished with no-seam vinyl plastic lining.

Rampe Mfg Co, 14915 Woodworth Ave, Cleveland 10, Ohio



Deburring Tool

Ellipti-Burr, Model EL5, is especially designed for deburring and chamfering of openly accessible hole faces having irregular surfaces.

Tool is self-piloting; conical pilot accommodates any hole size within its working range. Recommended operating speed is within 75-200 rpm range. Tool may be operated by portable air or electric drill motor, or in a machine tool spindle. Unit processes holes from 5/32 to 5/16-in.-dia.

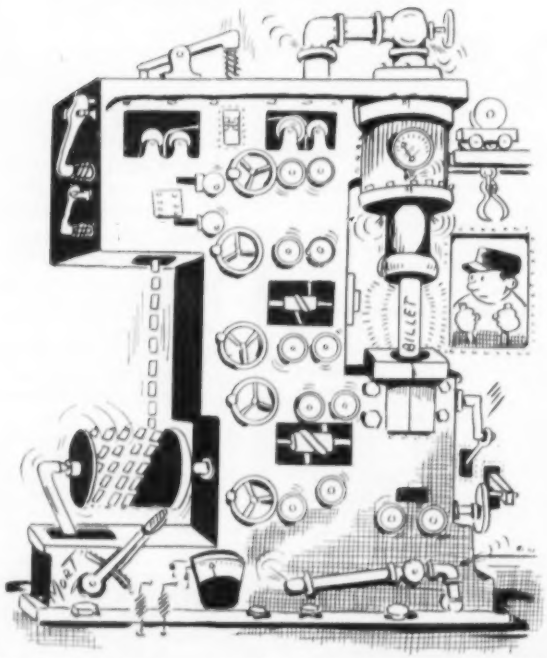
Nobur Manufacturing Co, 6860 Farmdale Ave, North Hollywood, Calif

Hydraulic Power Unit Increases Air Circuit Power

PT-10 is designed to give higher operating pressures and better control, using existing air circuits.

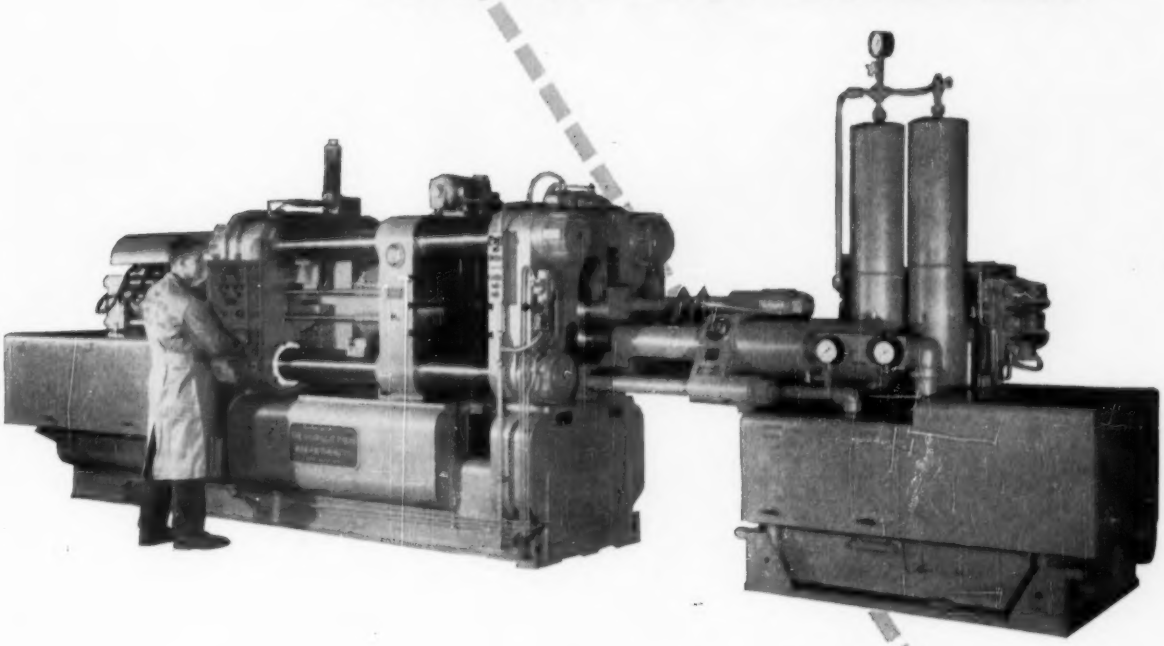
The 500-psi power unit comprises an electric motor, up to 1 hp, a vane pump (3, 6, 9, or 12 gpm) rated at 1000 psi, and a relief valve, all mounted on a JIC 10-gal. reservoir, complete with mounted accessories (breather, filler cap and screen, oil

MACHINES OF TOMORROW



New model Skipp Hot Wire Forming machine designed by the Draughting Board Instrument Co. It is expected to fill a long felt need in producing spy-proof dotted lines in carlot quantities for top secret government blueprints. The colors will be standard black, white and red.

THE INCOMPARABLE H-P-M DIE CASTER



First Completely New Die Casting Machine In 15 Years

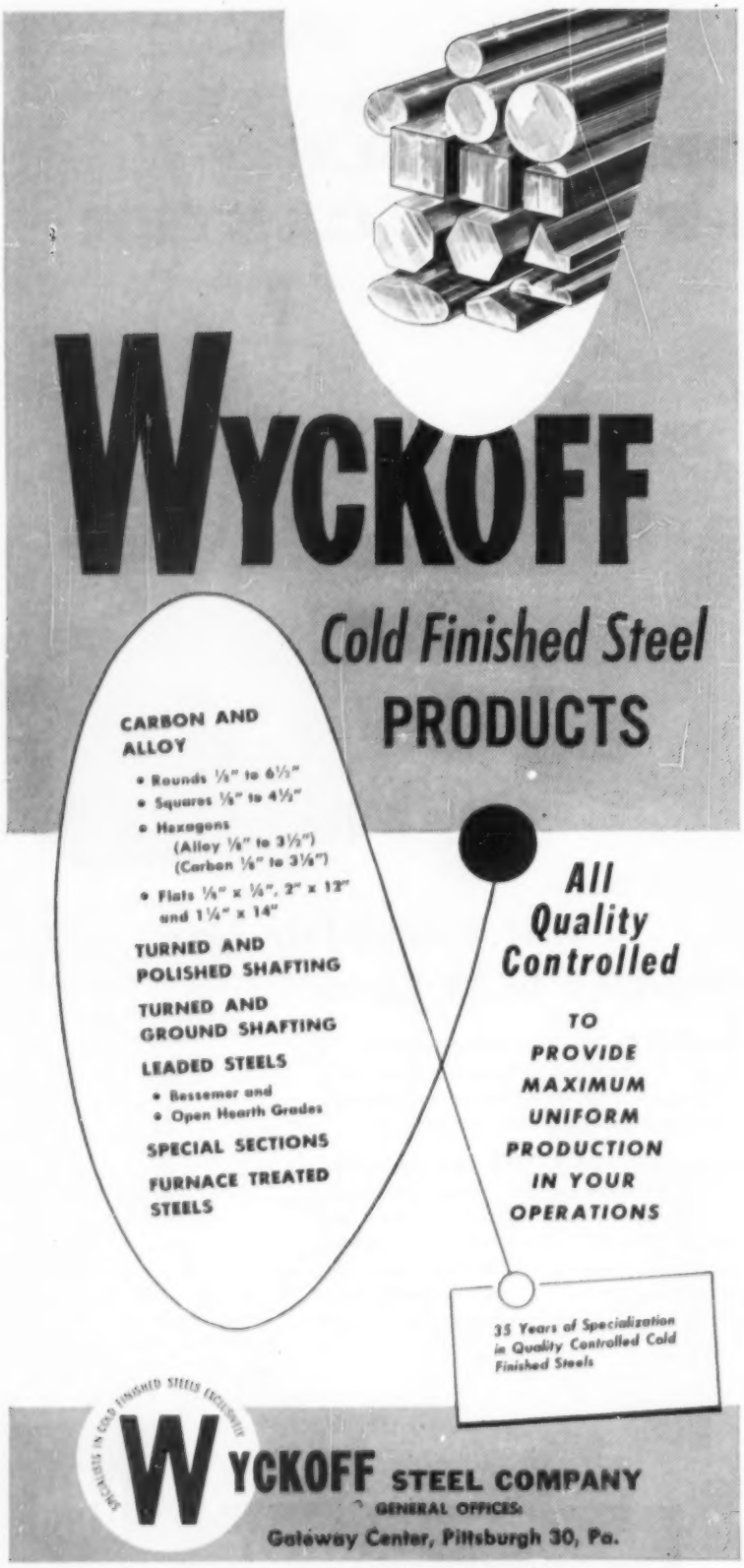
This new machine is the answer to many of today's die casting problems . . . cleaner castings . . . negligible scrap . . . better dimensional control with production output to meet any job requirement. It's time proved through four years of development with one year acceptance in the field.

H-P-M's all new hydraulic-mechanical link wedge clamp and new design injection end result in a brand new approach to die casting technique. Accurate closing of mold eliminates excessive flash. The new clamp has plenty of "beef"—clamp locks mold firmly to at least the rated tonnage and "beef" limits die parting on overload during metal injection. The new injection end has unlimited motion control . . . exceptionally high speed. Get the complete story on this new H-P-M before you buy. You'll be glad you did.

Write today for complete specifications for the new H-P-M die casting machines. Available in a range of sizes from 200 to 1500 ton capacities.

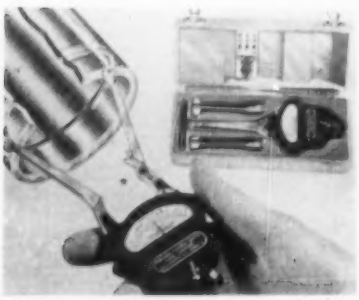
DIE CASTING DIVISION
THE HYDRAULIC PRESS MFG. CO.
Mount Gilead, Ohio, U.S.A.

HPM


WYCKOFF
Cold Finished Steel
PRODUCTS
CARBON AND ALLOY
• Rounds ⅛" to 6½"
• Squares ⅛" to 4½"
• Hexagons (Alloy ⅛" to 3½") (Carbon ⅛" to 3⅛")
• Flats ⅛" x ¼", 2" x 12" and 1¼" x 14"
TURNED AND POLISHED SHAFTING
TURNED AND GROUND SHAFTING
LEADED STEELS
• Bessemer and
• Open Hearth Grades
SPECIAL SECTIONS
FURNACE TREATED STEELS
All Quality Controlled
TO PROVIDE MAXIMUM UNIFORM PRODUCTION IN YOUR OPERATIONS
35 Years of Specialization in Quality Controlled Cold Finished Steels
SPECIALISTS IN COLD FINISHED STEELS EXCLUSIVELY
WYCKOFF STEEL COMPANY
GENERAL OFFICES:
Gateway Center, Pittsburgh 30, Pa.
Branch Offices in Principal Cities
Works: Ambridge, Pa.—Chicago, Ill., Newark, N.J.—Putnam, Conn.

level gage, baffles) and three circuit return ports. Reservoir, with mounted accessories, is designated Tk-10 and can be furnished to customers who wish to build their own systems.

Rosaen Co, PO Box 195, St Clair Shores, Mich



Groove Checking Gage

InteRapid groove checking comparator gage, a Swiss-made instrument for checking internal groove depths, has a capacity from ⅜ to 6 in. in diameter.

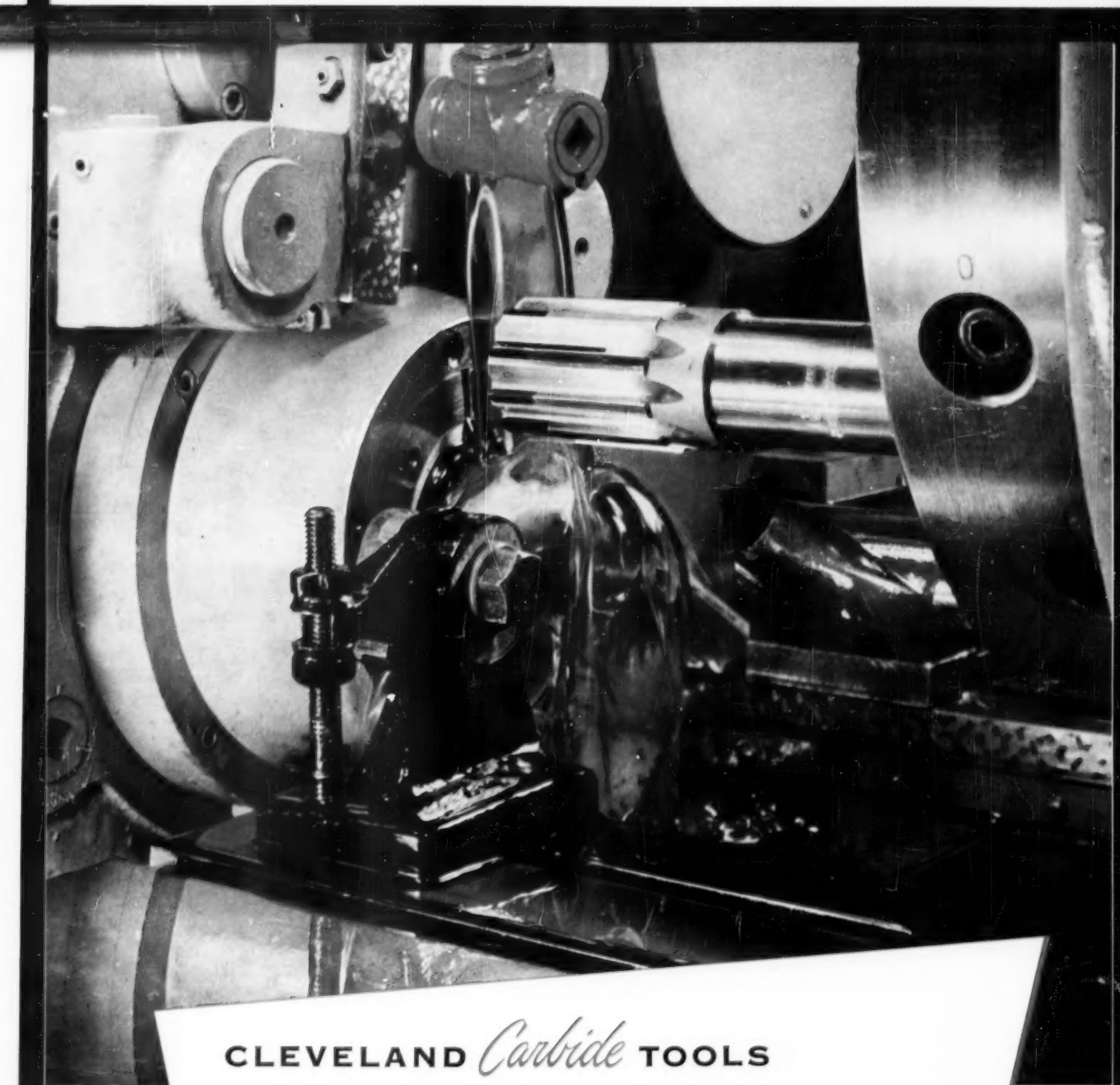
Serrated hinge joints keep tips parallel on wide measurements. Large meter face is graduated in 0.0005 in. Unit gives accurate 3-point checking for production runs, or 2-point for single units and short runs. Instrument is set by turning dial to zero reading and adjusting arms to gage blocks, mikes, or ring gages. Lever retracts measuring arms 0.400 in. to protect arms while device is being positioned. With smallest tips attached, it can enter a ¼-in. hole.

Portage Double Quick Tool Co, 1026 Sweitzer Ave, Akron, Ohio

Heavy-Duty Hand Truck

Model is made of 1¼-in. steel pipe braced with heavy steel plate. Recommended work capacity is 1200 lb.

Unit is equipped with snap-action, directional wheels which permit for-



CLEVELAND *Carbide* TOOLS

Drills • Reamers • End Mills • Counterbores

These superior tools retain a sharp edge under high temperatures and have excellent resistance to abrasion. In addition to regular tools, both solid carbide and carbide tipped, there are many CLEVELAND Carbide Tools for special purposes.

THE CLEVELAND TWIST DRILL CO.

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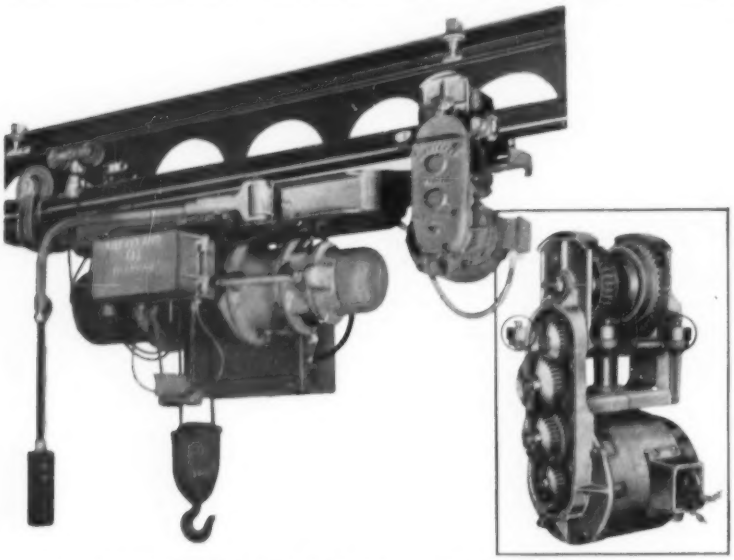
BEARING TIPS by McGill



CLEVELAND TRAMRAIL GUIDES MOTOR HEADS ON McGILL CAMROL BEARINGS

Motor-driven electric hoist carriers made by the Cleveland Tramrail Division of The Cleveland Crane & Engineering Company, incorporate McGill CAMROL Cam Follower bearings as side guide rollers for the motor head.

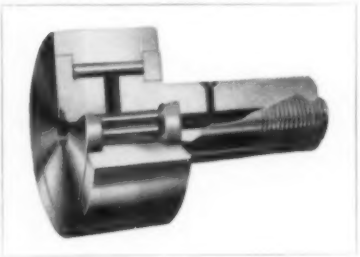
The CF bearings keep the motor head square on the monorail track used in this system and guide the head around curves. Moving on the rails at speeds up to 250 feet per minute, the bearings take the thrust load when entering into a curve.

Replacing spring loaded friction type bolt and roller units, the simplicity of mounting and the friction-free operation of the CAMROL cam followers provide dependable, trouble-free operation of the carrier assembly. Used almost six years, bearing performance has been most satisfactory.

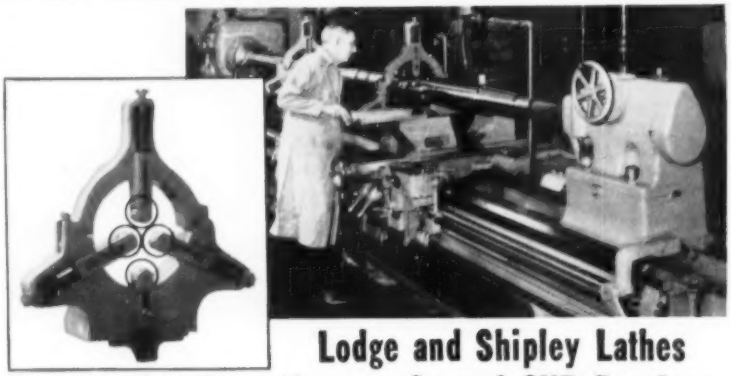
Fact-packed Bearing Catalog

Write for your copy of Catalog No. 52, a revised 140-page Bearing Selection Guide. It contains vital product information and 30 pages of engineering data.

CAMROL BEARINGS DIRECT ACCURATE CAM ACTION



Precision built throughout, CAMROL CF Bearings are designed to add the advantages of smooth accurate cam action to rugged shock-absorbing dependability in any type cam follower application. An interchangeable sealed SCF series protects critical installations.



Lodge and Shipley Lathes Support 18′ Propellors on Camrol CYR Bearings

Eighteen foot propeller shafts and other large work are supported and guided accurately on Lodge and Shipley Lathes through use of Camrol CYR Bearings. The Lodge and Shipley Company has standardized on these heavy duty Cam Yoke Roller Bearings for the Roller Jaw Steady Rest on their larger Engine Lathes. Four CYR bearings are mounted in a yoke at the ends of adjustable slides to provide dependable, precision support for a variety of work.

CAMROL CYR Series Adapts To Yoke Mounting

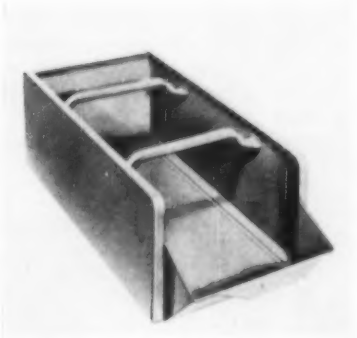
Internal construction of the CYR Series bearing is similar to that of a CF Series bearing with a heavy outer ring selection to withstand shock load. However, the stud is replaced by an inner ring for receiving shaft in a yoke mounting.

Insure performance with McGILL®

MULTIROL® GUIDEROL® CAMROL
Full Type Roller Bearings

McGILL MANUFACTURING COMPANY, INC., 300 N. LAFAYETTE ST., VALPARAISO, INDIANA

ward as well as sideways movement. Wheels are 8 in. in diameter with hard rubber tires and roller bearings.
Directo-Truck, Canfield, Ohio



MATERIALS HANDLING CONTAINERS designed for use with Bathey storage and handling systems are available in three sizes: 23 x 12 x 8 in., 14 x 12 x 8 in., and 14 x 8 x 8 in. All corners and edges are double-reinforced for strength. Two embossed runners are drawn in the bottom of the pan to act as guides for stacking. Various handle combinations are available.—*Bathey Mfg Co, Plymouth, Mich*

Master Gage

Model M-100 Set-Master was designed to accommodate a wide range of gage ID or OD settings. Fine adjustment is by key or wrench, quickly bringing settings to zero. A sliding contact button on each end may be set for 0 to 2-in. depth. Standard range for diameter setting is from 8 to 44 in.

By use of special-shaped contacts all types of datum checks may be made. Back pressure of the variable system assures control of the moving sensitive contact at all times.
Myer Corp, Providence, RI

Radiant heating units for industrial use come in two types—quartz-lamp oven sections and radiant-rod oven sections—both designed for easy assembly into infrared ovens. T-3 quartz lamp has high-temp (4000 F)

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Determining the style and type of cutting tools and gages that will do a given job best often takes engineering hours that you can ill afford to spare these days.

You can save many of these hours with Besly's Application Service. Besly Service Engineers are completely up-to-date on cutting tool and gage selection and application. They can analyze your jobs, select the right tool, and help lay out tooling set-ups to achieve longer tool life, less downtime, fewer rejects, and increased production. This service includes the development of "special" tools to fit your special needs. If you'd like proof of how it can work for you, write us.

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AUTOMATIC CHUCKING MACHINE

There are no half-finished pieces lying around at the end of the day when you put your work on this outstanding machine.

The "1-2-3" feature—available only on the Goss & De Leeuw Automatic Chucker—provides the means of finish machining three ends of a part without changing set-up.

Note some of the typical parts machined. Ask for illustrated literature giving further details and send samples of your work for a cost estimate on handling it on the Goss & De Leeuw.

GOSS & DELEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

tungsten filament sealed in an inert gas and surrounded by a translucent, fused-quartz shell. Lamp has rated life in excess of 5000 hr. Radiant-rod sheathed-metal elements can be interlocked to form oven walls of high intensity: units are available for high-intensity or general-purpose applications, and accommodate a single radiant rod of from 1100 to 3500 watts.

Fostoria Pressed Steel Corp, Fostoria, Ohio

LOW-LIFT PLATFORM TRUCK permits driver to sit down rather than stand, reducing operator fatigue. Electric-powered truck is available in capacities ranging from 10,000 to 20,000 lb. Platform sizes can be varied to meet specific needs. Truck is equipped with four-wheel steering, hydraulic platform lift, and can be built with hydraulic power steering. It may be powered by battery, gas-electric, or diesel-electric unit—*Elwell-Parker Electric Co, 4205 St Clair Ave, Cleveland 3, Ohio*

Synthetic lubricant called Hamikleer No. 1391 dissolves instantly in water to make a clear, thin, odorless lubricant reported to have good wetting properties. Maker reports that product cannot decompose, turn rancid during use, or affect workers' skin. For grinding steel, stainless, and alloys, dilution is from 1:40 to 1:70. For other metalworking operations the average dilution is 1:30 with water.

Harry Miller Corp, 4th & Bristol Sts, Philadelphia 40, Penna

Spot-Check Surface Thermometer

Made entirely of stainless steel, Pacific Transducer's surface thermometer has a range of from 50 F to 1000 F. Instrument is laid on the surface to be checked, and within 60 sec has reached stability, so that exact temperature can be read.

Device is said to read accurately temperatures of such surfaces as

Bellows DRILL PRESS FEED

AIR-POWERED RAPID TRAVERSE

HYDRAULIC FEED RATE CONTROL

ELECTRICALLY OPERATED

- **Installs in less than half an hour**
- **Often doubles, even triples production**

A Bellows Drill Press Feed quickly turns any standard manually operated drill press into an automatic or semi-automatic drilling unit—with full precision control over every phase of its operation.

A touch on the operating control and the drill rapidly advances to the work, is fed through the work under smooth hydraulic control, and returns to starting position. Cycling can be single or continuous. It can be electrically interlocked with work feeding and work holding devices.

The Bellows Drill Press Feed can be installed in less than half an hour. It can be moved from one drill press to another. It doesn't interfere with hand operation of the drill press.

More than 10,000 companies use Bellows Drill Press Feeds. In some plants as many as 400 Feeds are in everyday use—drilling, tapping, reaming, counter boring, threading—building production records that are hard to believe unless you use Bellows Drill Press Feeds yourself.

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FOR FASTER, SAFER, BETTER, AND LOWER COST PRODUCTION

Electrical Discharge Machining

saved $448 sinking this forging die using Brass electrodes

Conventional Method

Mill Cavity (Man and Machine)	56 hours
Hand Finish (Experienced die sinker)	52 hours
TOTAL	108 hours

ELOX method

Forge Electrode (Man and machine)	2 hours
Set up and change electrodes (man and machine)	8 hours
Machine hours only (no operator required)	32 hours
Hand finish after E.D.M.	2 hours
TOTAL	44 hours

Saved: 64 hours at $7 per hour

additional EDM advantages in forge die machining:

- Dies are fully heat treated prior to machining thus eliminating possible distortion.
- Resizing forging dies after washout can be done within two hours.
- Inherent workhardening values are retained in the dies since no additional re-heat treating is necessary.
- Actual die life is increased.
- Many forge die alloys are self-polishing after EDM.

This machining application is one of many time and material saving jobs being turned out by the standard Elox M-500 Electronic Machine Tool. See EDM in operation at Elox Demonstration Centers.

*T.M. Reg.

elox

corporation of michigan

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Elox Electron Drills for removing broken taps, drills, etc., from $495 to $3450.

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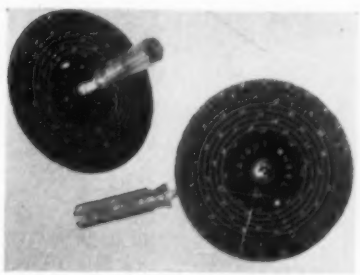
1828 W. Monterey, Chicago, Ill.

dies, hot plates, heavy sheet metal, cooled billets, and boilers. Besides surface temperatures, it also reads ambient temperatures in furnaces, ovens, and other enclosed spaces, as well as in non-corrosive liquids and gases.

Device comes calibrated to within ±2%, and can be reset by user at any time. Unit, designated Model 573, has 1¾-in. diameter and is priced at $3.00.

Pacific Transducer Corp, 11836 W Pico Blvd, Los Angeles 64, Calif



Idex Layout Wheel

Device provides both a measuring wheel and a conversion chart on the face for quickly converting from diameter to circumference or vice versa. Wheel, calibrated in inches around its circumference, contains a number of concentric circles graduated in diameter figures.

Unit provides a means for quick calculation and layout of tubular constructions and gives a permanent record of the conversion figure. Scale on circumference of wheel can be utilized to check circumference of ducts or pipes which have already been constructed.

Idex Manufacturing Co, 1741 Fourteenth St, Santa Monica, Calif

Creep-testing machine developed by Baldwin-Lima-Hamilton is reported capable of performing four basic types of creep tests: long-time tests, load being applied and measured by weights on a lever arm; creep-rupture tests, with motor-driven screw loading under control of a load transducer and null-balance controller; relaxation testing; and constant-strain-rate testing. No foundation bolts are required for base; enclosed cushion mounts are equipped with leveling screws. Furnace providing for tests up to 1800 F is tubular type 16 in. long which has thermocouple for heat measurement and control. Creep measurements can be made

(Continued on page 208)

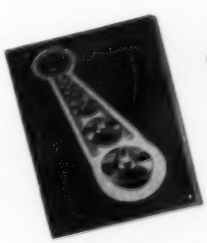
60 CALIBER LINKS FOR THE HIGHEST CALIBER PRODUCTION!

Stations by the dozens . . . tolerances to the ten thousandths . . . production in the millions . . . with progressive dies by

B. Jahn

60 caliber single and double loop links . . . produced by the millions — and hundreds of millions — and all must be absolutely identical, accurate! These stringent specifications demand the finest dies and diemakers — that's why B. Jahn was selected. The master toolmakers and engineers at B. Jahn built a 13 station and 16 station progressive die that formed the intricate components from heavy SAE — 1055 steel. Million plus runs . . . precise fidelity . . . and lasting economy . . . were engineered into every die — and verified by "production proving" in the B. Jahn plant before delivery. Whatever your product, your problem — B. Jahn die making ingenuity can help you deliver better goods . . . in less time . . . at less cost.

Die ribbons showing 13 and 16 stations necessary in producing tremendous runs of shell loop links!



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how to spin a good yarn

The happy ending comes quickly when Avey machines are in the story, as the makers of this textile spindle base discovered. Savings in production time, direct labor, and plant space will probably return their equipment investment in a single, solitary year.

What makes Avey machines such high-yield investments? For one thing, they're generally simple assemblies of basic components on which the engineering has largely been paid for. Costs are lower; the price becomes more favorable; the savings per part, or per hour, pay off the investment sooner.

For another: we take our own medicine. You'll find most of the machines in our shop young, and shiny, and productive.

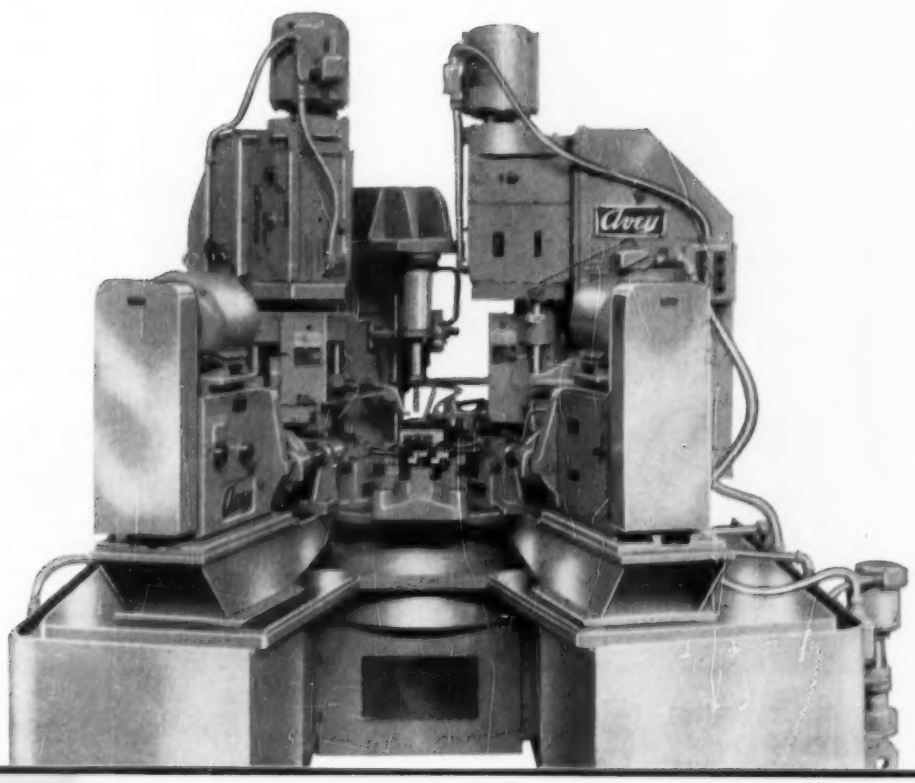
▸ **production data:** This 6-station Avey indexing machine performed drilling, tapping, milling, and broaching operations. Fixtures arranged to handle two different parts. Milling and broaching done in one pass, with cycle time of 8 seconds. Rate: 380 parts/hr. at 100% efficiency.

THE AVEY DRILLING MACHINE CO., CINCINNATI 1, OHIO

drilling, tapping, production machines

with a happy ending

Avey



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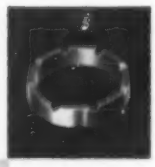
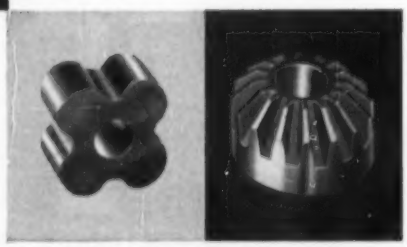
BEARING DESIGN and APPLICATION

The inauguration of Bunting's new facility for engineering and manufacturing bearings and parts of Sintered Powdered Metals opens a wide new area of opportunity to all mechanical industry.

Sintered Powdered Metal Bearings and parts offer real economies in design. Bunting Engineering and manufacturing skill and traditional technical responsibility assure your most advantageous use of this material.



A competent group of Bunting Sales Engineers in the field and a soundly established Product Engineering Department put at your command, comprehensive data and facts based on wide experience in the designing and use of Cast Bronze and Sintered Powdered Metal Bearings and parts.



Write to our Product Engineering Department in Toledo, or consult our nearest Sales Engineer.

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BUSHINGS, BEARINGS, BARS AND SPECIAL PARTS OF CAST BRONZE AND POWDERED METAL

The Bunting Brass and Bronze Company • Toledo 1, Ohio • Branches in Principal Cities

inside the furnace by means of an extensometer attached to the specimen over a 3 1/2-in. gage length.
Baldwin-Lima-Hamilton Corp, Philadelphia 42, Penna

GEARLESS DRILL HEADS designed especially for drilling printed circuits have been added to Zagar line. Formica has been adapted for use in guide and drive plates; hole pattern of the printed circuit is drilled simultaneously in three Formica plates. User can remove the plates, store for future use, and replace with new hole patterns as required. Holes as close as 0.140 in. between spindles can be drilled. Capacity range is a rectangular pattern up to 6 x 14 in. in size —*Zagar Tool, Inc, Lakeland Blvd, Cleveland 23, Ohio*

Light-alloy slide rules made by Pickett & Eckel are of green-yellow color. According to maker, colored shade coincides with optimum sight point of the spectrum, cutting eyestrain, blurring, and errors in reading calibrations. Non-corrosive, nonrusting metal construction eliminates warping, swelling, and binding. Rules are made in 6- and 10-in. trig, log-log, or special-order types.
Pickett & Eckel, Inc, 1109 S Fremont Ave, Alhambra, Calif

Steel-cutting carbide, Grade NS-3, has been developed by Newcomer for general-purpose machining and milling of steel forgings, castings, weldments, plate, and highly abrasive steels. Maker reports that grade has exceptionally high edge strength and resistance to shock and chipping.
Newcomer Products, Inc., Latrobe, Penna

ROUND TABLE Discussion

RUMOR BOARD

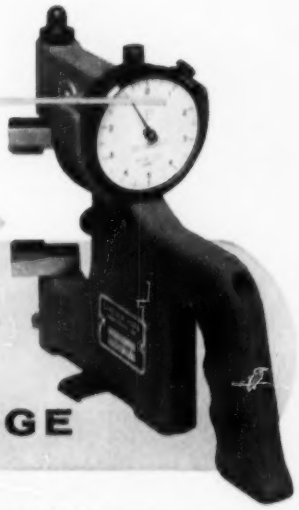
Can rumors be dispelled by an official company explanation posted on something similar to a bulletin board? Will employees accept such an explanation, or view it with a jaundiced eye as just some more management propaganda?

RUMORS ARE one of the greatest souces of ill-will in the shop or business organization. Rumors are like weeds that spring up in a garden and choke off the flowers or vegetables.

People are ever willing and ready to demonstrate their knowledge. Approach a stranger in the street and he will never refuse to present complete, detailed information on how to get to a particular destination. In fact, he is usually so happy at having an opportunity to demonstrate the extent of his knowledge that he will include many extraneous and unnecessary details and frequently insist on explaining not one, but several alternate routes which can be taken.

This same desire is observable at other times. There is a certain fascination attached to being the first to know about something, not because of any particular value attached to the possession of the knowledge, but only because being first provides an opportunity for telling others. This is the reason why people are so anxious to read the best sellers and see the latest shows and movies. It is unfortunate that this same enthusiasm does not carry over to the latest literature on the tools, methods, and machines applicable to the operations performed in the shop. Instead,

These are the ONLY wear parts in a Lincoln Park DIAL SNAP GAGE



The only wear parts in a Lincoln Park Dial Snap Gage are the anvils and indicator. There are no bearings, levers, shafts or cams to get out of adjustment. Because of this simplified construction, maximum accuracy is assured over a long period of time, maintenance is negligible, and trouble-free operation is certain.

Other features of these gages include precision adjustment of the upper anvil within a ¼" range . . . no possibility of damage to the gages by accidental shock . . . parallel anvils tipped with solid cemented-carbide to provide long service life. Ten standard models are supplied in sizes up to 2.500 inches and larger models and special types are furnished to customers' specifications.

A new bulletin on Lincoln Park Dial Snap Gages is now available. Write for your copy—today.

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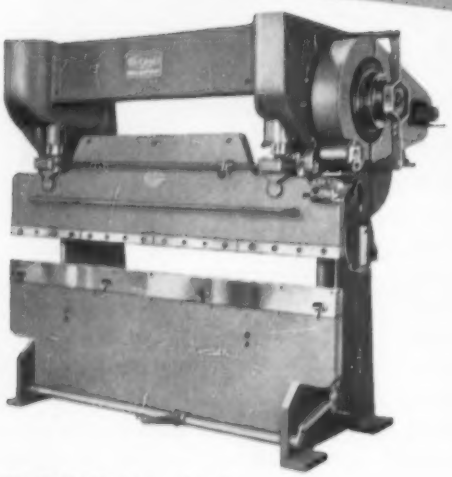
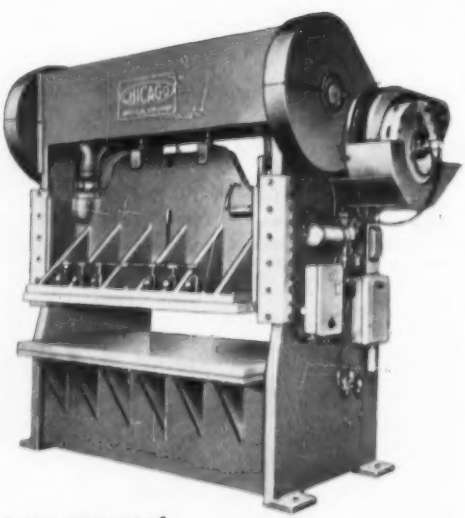


CHICAGO Press Brakes
Five Models for Sheet Metal Work
11, 30, 36, 50, and 60
Ton Capacities



CHICAGO Straight-Side and Gap Presses with Large Die Area for blanking, punching, trimming, and shallow drawing. Custom built to individual requirements in stroke, die space, and bed area.

Descriptive Literature on request

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Hand and Power Brakes • Special Metal-Forming Machines

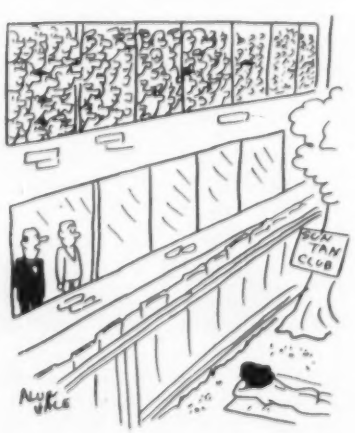
DREIS & KRUMP MANUFACTURING CO.

7434 South Loomis Boulevard, Chicago 36, Illinois

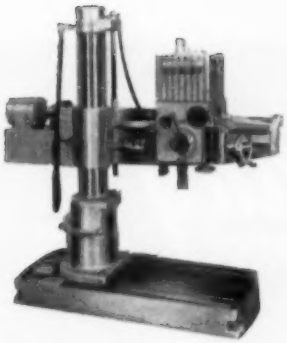
the interest is centered on the people in the shop and the plans of the company as they affect the employees.

Man is a social being and does not live apart from his fellow men. Instead, his fellow men become a subject of interest and a topic of conversation. Most rumors, or at least the popular ones, are derogatory, and in criticism of the company, or an employee, or supervisor. Apparently this is to be expected because it is so much easier to criticize than to praise. The real reason behind this strong, inherent desire to gossip and spread rumors lies in its capacity for inflating the ego of the rumor-mongers. There is a great deal of jealousy in this world and, as a result, derogatory rumors are used as a leveling-off tool to lower the position of others and also as a pry-bar to elevate our own standing.

It is very fine to try to solve a problem by seeking the solution which embodies the highest ideals, but it is frequently more practical to eliminate a problem by short-circuiting or circumventing it. Some shops attempt to eliminate gossip and rumors by educating the employees to the harm they can cause, and to the baseness of constantly criticizing others. The rumor board seems to be a more realistic solution because it removes a good deal of the incentive which people have for perpetuating rumors. There is not much satisfaction in telling someone about a rumor when the true information is already posted on the board. Employees will also be hesitant about making up new rumors or even passing them on because a contradiction may soon appear on the rumor board. The degree of secrecy attached to the rumor determines the amount

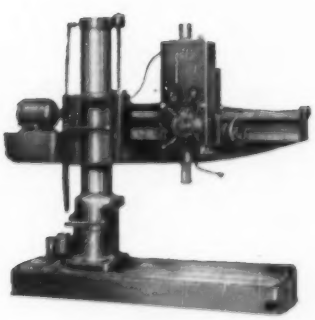


"Well, there must be something around here stopping production."



FIRST WITH HARDENED COLUMNS

for 9" and 11" radials



Now, for the first time, you can gain the advantages of hardened columns on radial drilling machines with 9" and 11" columns. Because they resist scoring and hold dimensional accuracy under most extreme conditions, these new columns may well add years of service to our machines.

We offer them to industry only after several years of experimenting and testing have proved our procedure. After we turn the cast columns, we flame-harden them to Rockwell C 52-56, at a depth of 1/16" to 3/32". Then we finish grind them to close tolerances in straightness, roundness, and surface finish.

It will be worth your time to write us today.
The Cincinnati Gilbert Machine Tool Co.
3366 Beekman St., Cincinnati 23, Ohio

A 3' arm 9" column radial can be purchased for as little as $1100 down and $80.67 a month for five years. Includes 6% simple interest (or about 3% add-on).

those who buy Gilbert buy **GILBERT** *again*

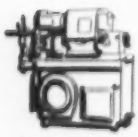
Amazing
LIPE Automatic BAR FEED...

. . . Feeds Bars, Rods, Tubing Continuously to your Machine Tools. Lipe Automatic Magazine-Loading Bar Feeds have boosted output well over 100% in many applications! Air-operated, they automatically feed a continuous supply of bars, rods or tubing to any machine which can be equipped with a feed-length stop. They will boost production on all the machine tools shown here.

Turret Lathes

Centerless Grinders

Cold Headers



Automatic Screw Machines

Thread Rollers

Punch Presses

NO TIME LOSS with A.M.L. Bar Feed!

- Allows quick set-ups with no tricky adjustments
- Feeds any length in one feed . . . no repeat motion
- Ejects remnant automatically . . . no shutdowns for remnant removal

Lipe Bar Feed experts will be glad to tell you: whether bar feed is applicable, how much it will save, how long to amortize cost. Our booklets and data sheets give further information. Send for your copies.

Lipe-ROLLWAY CORPORATION SYRACUSE 1, N.Y.

Manufacturers of Automotive Clutches and Machine Tools

of pleasure we get from passing it on.

The rumor board will remove all secrecy and will eliminate the opportunity for exaggerating and embellishing the story. If the rumor board is handled by an energetic person with lots of enthusiasm and a good understanding of the ways of people and the workings of their minds, it cannot help but be a success.

William Martin
Brooklyn, NY

A "RUMOR BOARD" is not a good idea. Notices pasted on a bulletin board denying a rumor acknowledge gossip and recognize the justification of it. Rumors, or gossip, are not conducive to employee-morale. They are born of fear, feed on prejudice, and appeal to the emotions.

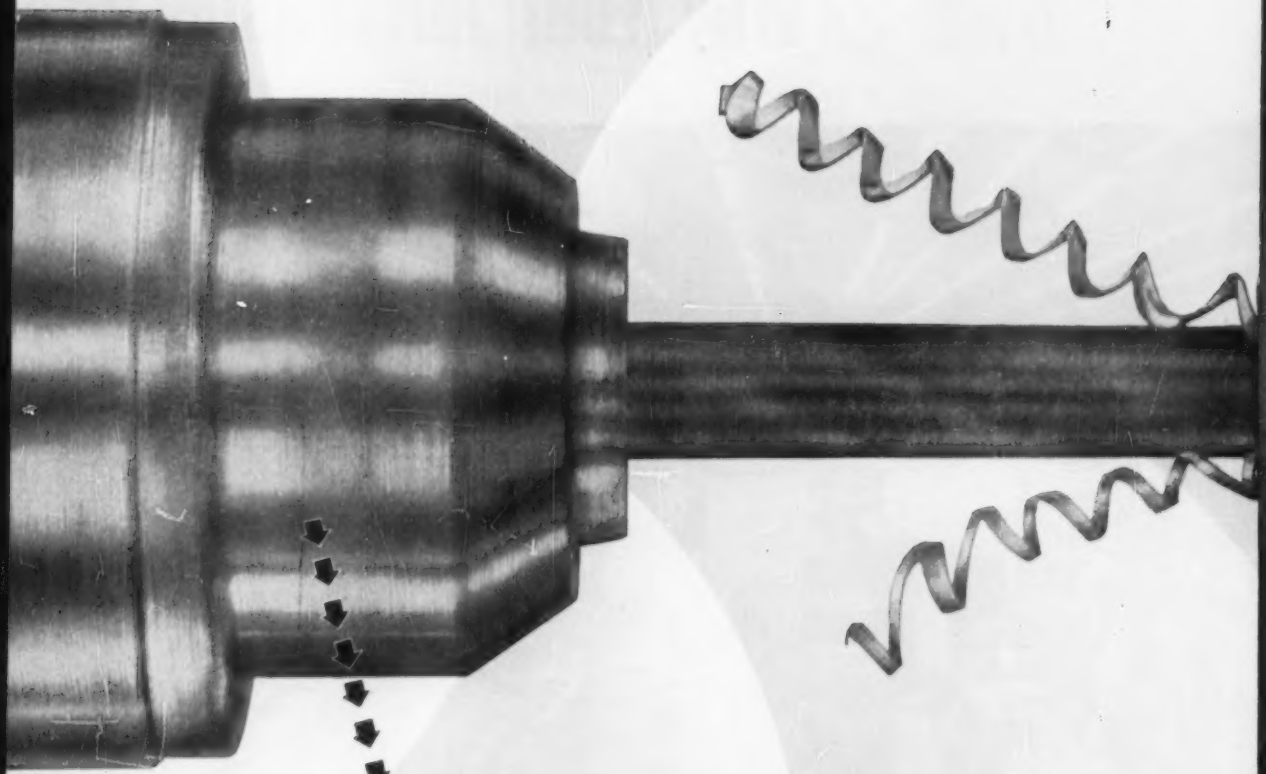
Don't fight rumors. Eliminate their cause,—poor employee communications. A successful company, successful because it can meet any kind of competition, welds an iron-like channel of communication between management and labor.

At this stage of the industrial revolution managers of a free enterprise operate within a glass house. Friendly eyes, like the ostrich with its head in the African sands, don't peek. Unfriendly eyes do peek. They gaze and they glare. The communist, the socialist, the welfare-stater, the demagogue watch for an opportunity to promote their cause at the expense of the champion, the free-enterprise system.

Rumors are handicapped by neither logic nor truth. They

(Continued on page 217)

"That the company sponsors a bowling and baseball team is entirely beside the point!"



100 to 1 . . . it's a *Jacobs* CHUCK

Jacobs and your industrial supply distributor are ready to deliver the chucks you need and the service you deserve. First in chucks . . . first in service.

THE JACOBS MANUFACTURING COMPANY • WEST HARTFORD, CONN.

The Jacobs Model 91 Spindle Nose Collet Chuck for tool room and engine lathes.

The Jacobs Rubber-Flex® Tap Chuck for tapping heads and impact tools.

The Jacobs Plain Bearing Chuck for drill presses, portable electric and air tools.

The Jacobs Ball Bearing Super Chuck for heavy duty and precision industrial use.

The Jacobs Model 96 Collet Chuck for grinding machines, millers and jig borers.

The Jacobs Impact Keyless Chuck especially designed for the aircraft industry.

Why Your Advertising in

● **ON THE JOB IN AIR CONDITIONING** — photo shows assembly line at one of the plants in which Worthington makes packaged air conditioners.

With seventeen domestic production units, and twelve factories abroad, Worthington produces eleven major lines. Products include pumps, steam condensers, feedwater heaters and ejectors . . . mechanical power transmission equipment . . . welding positioners and turning rolls . . . engines, liquid meters, steam turbines . . . construction equipment . . . electric motors, generators and controls . . . heating, air conditioning and refrigeration equipment.

American Machinist Works Hard

...in plants such as this. At Worthington Corporation...

a "cool" 94.7% of purchasing dollars go for machinery,

equipment, materials and other supplies for *production*

Consider Worthington Corporation—115 years in business—traditionally a leader in capital goods production . . . pioneer manufacturer of air conditioning equipment.

Here at Worthington, you see another example of the purchasing pattern in Metalworking. It's a purchasing pattern in which the major expenditure is for the tools and needs of *production* engineers and executives.

Now consider *American Machinist* . . . the sure way to reach these men who buy for Metalworking . . . the men responsible for production. It's edited for Metalworking production engineers and executives—*exclusively!* Accepted by them—*more completely than any other magazine!*

Ask your *American Machinist* District Manager . . . WHY!

...*bought* by the men who *buy* for Metalworking

THE McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION
McGRAW-HILL BUILDING
NEW YORK 36, NEW YORK
PUBLISHED EVERY OTHER MONDAY
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS
AND THE ASSOCIATED BUSINESS PUBLICATIONS

Crane acking ompany

FLAT LAPPING SERVICE

NEW High Production Flat Lapping Facilities

Lapmaster® DIVISION CRANE PACKING COMPANY
6400 Oakton Street, Morton Grove, Ill.

Need parts finished to precision flatness?

Read this folder

If you're looking for someone to produce precision flatness on your parts, our flat lapping service department is equipped to produce parts with a flatness of .000011 inch or less and finishes to 2 micro inches on a wide range of sizes in large or small production runs. Materials range from steel, Stellite, cast iron, brass and aluminum to plastics, glass, ceramics, carbons and many others.

Thirty-six machines, together with "know how" and precision inspection facilities, insure work to meet your requirements. Branch service plants are also located in Houston, Los Angeles, Miami, New York, Philadelphia and Hamilton, Ontario.

For complete information, write for this free folder today.

CRANE PACKING CO.
6436 Oakton St., Morton Grove, Ill. (Chicago Suburb)
In Canada: Crane Packing Co., Ltd., Hamilton, Ont.

Lapmaster® DIVISION

CRANE PACKING COMPANY

38 YEARS INDUSTRIAL PROGRESS

emerge out of the darkness and seem immune to whitewash. Tacking a paper on the wall will not nail down a rumor.

Management lives in a glass house because it wants to be fair to the public, the employee, the stockholder, the customer, the supplier, and the economic system under which it operates. People who live in glass houses must be on their best behavior, always. Their policies must be truthful, their plans logical.

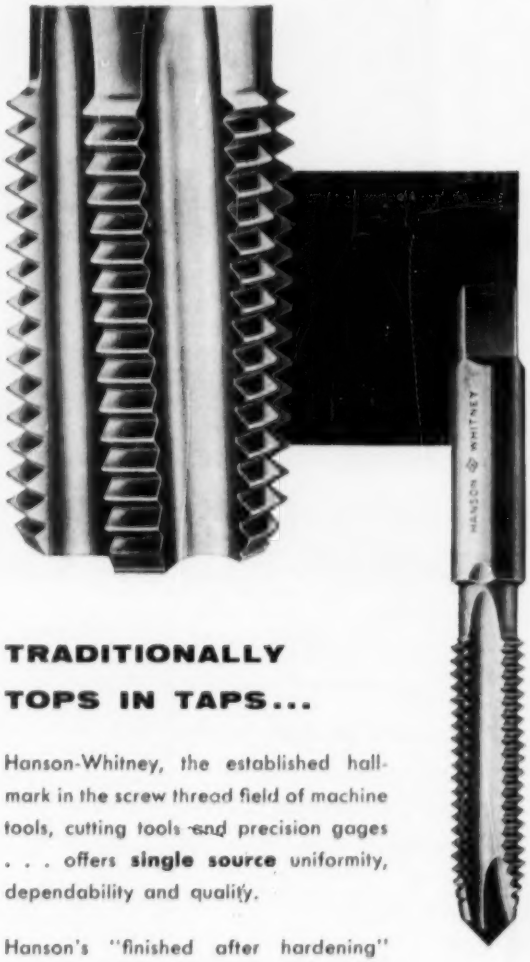
Rumors in the shop will decrease as the efficiency of management's channels of communication increase. The oldest method of communication, face-to-face, is still the best. It is logical for management to keep their employees informed through that member of management best known to the employee, the shop foreman.

In the bustling shops of any competitive enterprise where there is a man working there will be a foreman. Where there is a man not working there will be a foreman there too, that's for sure. If rumors are everywhere, the logical candidate to squelch them is the member of management who is everywhere too, the foreman. Eliminate rumors by keeping the foreman informed. Channel information through him.

Workers know their foreman. When the foreman has the facts to answer their questions they will have sufficient confidence in management to pay no mind to rumors. In a really progressive enterprise the foreman holds informative meetings with his men before they begin asking questions.

It costs money to have a good employees' communications setup. Every big corporation has one. They dare not miss an opportunity to im-

"All right, Beesman! . . . it's the second door on your right!"



TRADITIONALLY TOPS IN TAPS...

Hanson-Whitney, the established hallmark in the screw thread field of machine tools, cutting tools and precision gages . . . offers **single source** uniformity, dependability and quality.

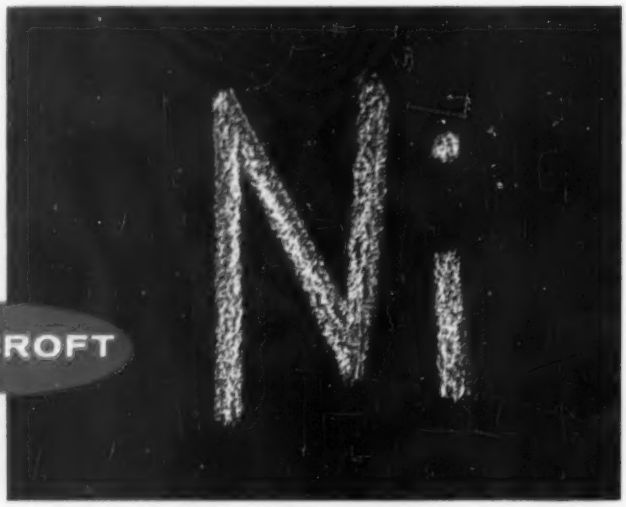
Hanson's "finished after hardening" process pioneered laboratory precision in commercial tap production. Hanson next engineered thread gages of finest accuracy, establishing Hanson-Whitney precision as the standard of the industry.

Consult Hanson-Whitney on all threading requirements . . . our field engineers can quickly assist in all problems.

Write for further information and literature —

Hanson-Whitney
COMPANY
DIVISION OF THE WHITNEY CHAIN COMPANY
170 BARTHOLOMEW AVENUE • HARTFORD 2, CONN.
TAPS • THREAD GAGES • HOBS • CENTERING MACHINES THREAD MILLING MACHINES AND CUTTERS

BLAZING THE HEAT TREAT TRAIL WITH HOLCROFT



LET'S TALK ABOUT THE
NICKEL SHORTAGE

Today's shortage of nickel—caused by government stockpiling—has important repercussions for potential buyers of heat treat furnaces.

Heat-resistant alloys may be used in radiant tubes, rails, and other interior sections of the furnace only when nickel is readily available.

That's why we have developed a furnace to meet this challenge—*one that requires no alloys,* yet will meet all the requirements of trouble-free life, low cost, stepped-up production, and high quality control. This is just another example of Holcroft pioneering in furnace design. Better investigate —right now!

OTHER RECENT HOLCROFT FIRSTS

- 1955—Developed a bantam-sized batch furnace using a minimum of alloys.
- 1954—Developed "Lo-Dew" generator for producing exothermic and endothermic atmospheres.
- 1951—Installed silicon carbide skid rails in conveyorized furnaces.

HOLCROFT AND COMPANY
6545 EPWORTH BOULEVARD • DETROIT 10, MICHIGAN
PRODUCTION HEAT TREAT FURNACES FOR EVERY PURPOSE

CHICAGO, ILL. • CLEVELAND, OHIO • DARIEN, CONN. • HOUSTON, TEXAS • LOS ANGELES, CALIF. • PHILADELPHIA, PA.
CANADA: Walker Metal Products, Ltd., Windsor, Ontario

prove their competitive position. They want high employee-morale.

Rumors are demoralizing. They sap the strength of competitive spirit. They are a defense mechanism to protect the weak from a fear of the unknown. We are all weak. We worry and become fearful when our sense of security is threatened. Though our worst fears are never realized, though we have nothing to fear but fear itself, we can be demoralized by rumors.

A man full of fear can be a dangerous man. Rumors can be dangerous because they can be, and often are, mean, cruel, and downright vicious. Pasting a paper on a pock marked board won't help much. A good employees' communication program will take the uncharitableness out of their meanness, the sting out of their cruelty, and the poison or spite out of their viciousness.

Peter A Seward
Swampscott, Mass

New Books...

METALS HANDBOOK, 1955 SUPPLEMENT —*Edited by Taylor Lyman. Published by The American Society for Metals, 7301 Euclid Ave, Cleveland 3, Ohio. 208 pages. Price $6.*

This new supplement follows the same general pattern as the first supplement to the Metals Handbook, though the subject matter is quite different. The first supplement concentrated primarily on subjects that were covered in the 1948 handbook, but on which much more extensive information is now available.

The 21 articles in this supplement tend more to broaden the scope of the original. Thus, in the Metals & Applications section there are five articles. All five deal with the selection of metals: sheet steel for formability, material for press forming dies, gray cast iron, stainless for chemical process, and aluminum alloy castings.

In the Processing and Fabrication section, most of the articles deal with heat treating. They include induction hardening, flame hardening, gas carburizing, control of surface carbon content, and the forging and heat treating of tool steel. In addition there are articles on electrode selection for manual arc welding of low-carbon steel and on the cost of metal cleaning.

The section on Testing and Inspec-

5th in a Series

OF HIGH PRODUCTION CASE HISTORIES

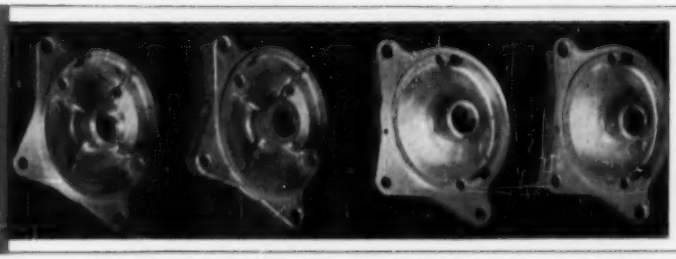
ASK BAIRD ABOUT IT

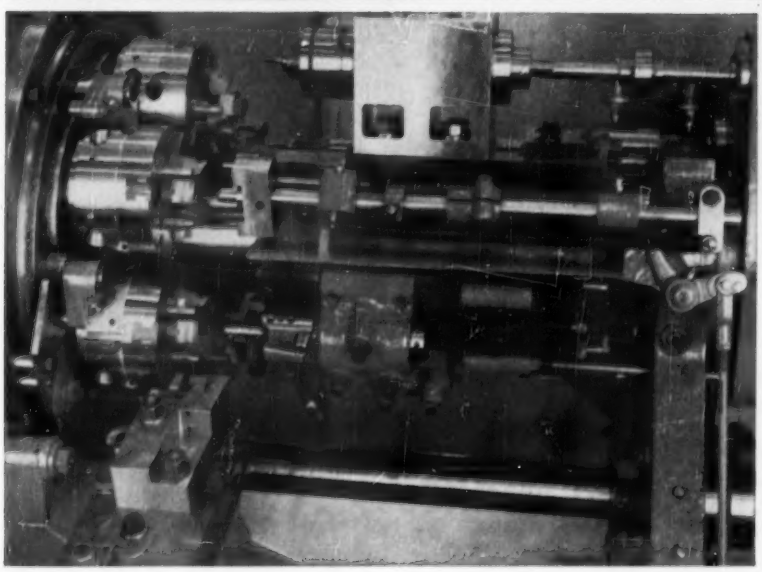
Baird Automatic Chucker again hits *PEAK PRODUCTION*

PART: Rear End Plate of Starting Motor

MATERIAL: Die-Cast Aluminum

PRODUCTION: 420 PIECES PER HOUR





OPERATIONS

Back face and chamfer one end of hub, using a recessing tool. Bore center hole concentric with flange diameters with high speed boring head. Face both sides of flange and turn the diameters concentric with hole. Bore a small hole off center with high speed boring head and tap two holes. The work is located in proper position and held stationary while the off-center hole is bored and the two holes tapped.

TOOLING...

The Baird Automatic 76H Chucking Machine is arranged for single indexing and with a recessing tool for back facing . . . high speed boring heads . . . two-spindle lead screw tapping attachment. A typical example of the endlessly varied and basically simple arrangements possible with this versatile unit.

Write Dept. AM.

THE BAIRD MACHINE COMPANY

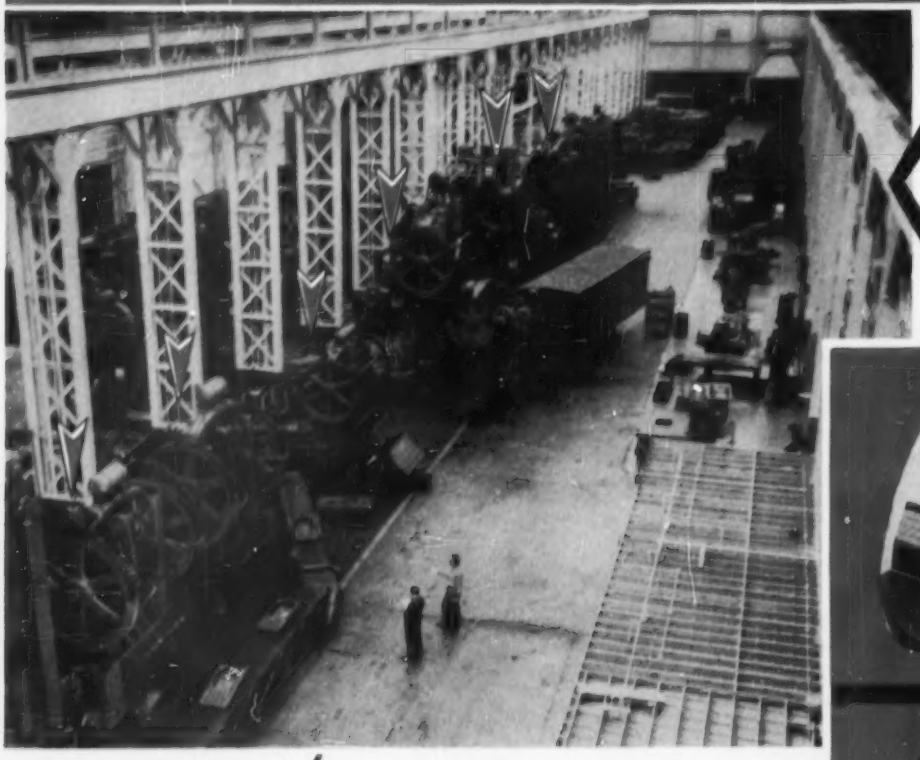
STRATFORD CONNECTICUT

WHERE YOU WILL GET THE HELP OF SPECIALISTS ON THESE ESSENTIAL PRODUCTION PROBLEMS:

AUTOMATIC MACHINE TOOLS • AUTOMATIC WIRE & STRIP METAL FORMING MACHINES & AUTOMATIC PRESSES • THREADING DIES

BRASS

FAWICK *Products in Action*
IN THE METALWORKING INDUSTRY



Typical line of heavy tonnage presses at Briggs Beautyware plant — nine of which are equipped with Fawick Clutches and Brakes.

BRIGGS *Beautyware gets production PLUS with FAWICK Clutches and Brakes!

FAWICK Clutches and Brakes help Briggs Beautyware maintain their leadership in the Plumbing Fixture Industry. They do this by insuring top-efficiency production on nine heavy tonnage deep-draw presses. Reports on operation of these FAWICK units include:

"... 15 months heavy duty operation without downtime for repairs"

"... have contributed greatly to uninterrupted production and lower maintenance costs"

"... planning more conversions to FAWICK equipment"

The obvious conclusion drawn from this and similar field reports in many industries is that FAWICK-EQUIPPED machines produce more work, at less cost—and with greater safety to operators and equipment.

The nearest FAWICK representative or the Home Office will be glad to show you why "IT WORKS BEST WHEN FAWICK-EQUIPPED". Simply call or write today.

FAWICK AIRFLEX DIVISION
FAWICK CORPORATION
9919 CLINTON ROAD • CLEVELAND 11, OHIO
In Canada: Fawick Canada, Ltd., Toronto, Montreal

FAWICK Airflex
INDUSTRIAL CLUTCHES AND BRAKES

Field Offices and Representatives in principal cities

tion includes three articles. These cover creep and creep-rupture tests, radiography, and macro-etching.

The general format and the approach to the subjects follow the pattern set by the 1948 Metals Handbook.

•

MECHANISM—*By Joseph Stiles Beggs, Technical Staff, Hughes Aircraft Co, formerly associate professor of engineering, University of California at Los Angeles. Published by McGraw-Hill Book Co, 330 W 42nd St, New York 36, NY. 418 pages. Price $6.50*

Designed as a text for an advanced course in kinematics, the book will also prove useful to practicing engineers with a good background in mathematics and dynamics. A glossary of the special terms is provided as an aid to those whose basic knowledge is rusty, but who need to use the book as a reference.

Of special interest also is an independent chapter called "A Reportory of Mechanism." This includes illustrations of some basic mechanical movements arranged alphabetically by the type of motion they produce. For example, five basic mechanisms for obtaining a snap action are illustrated together.

The book does not purport to cover machine design and so tends to avoid discussions of standard practice, concentrating on giving a thorough knowledge of kinematics.

The mechanisms covered include gears, cams, rotary drives, linkages, tension and flexural links, compression links, and computing mechanisms, supplemented by a discussion of control of mechanisms.

•

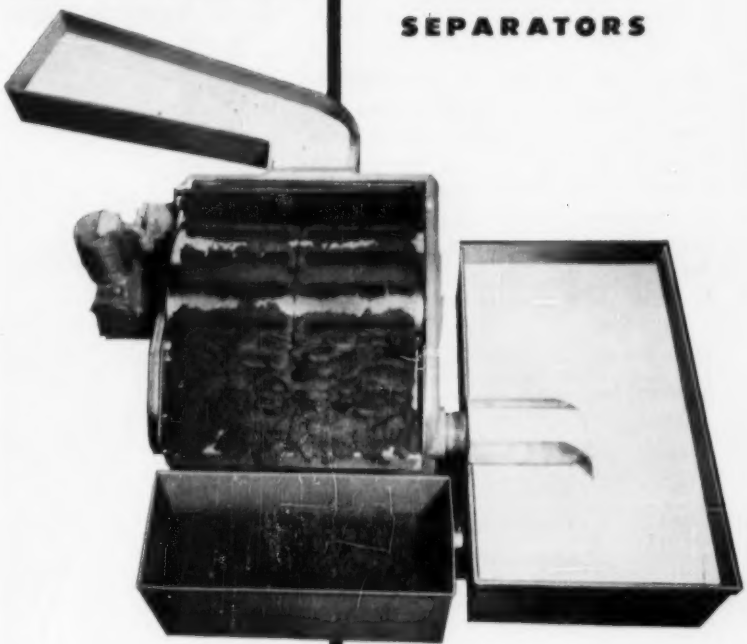
MACHINING KAISER ALUMINUM—*Published by Technical Publications Dept, Kaiser Aluminum & Chemical Sales, Inc, 228 N LaSalle St, Chicago 1, Ill. 308 pages. Free on company letterhead; Price $2.00 for personal libraries.*

The space devoted to each type of machining in this book is determined primarily by the degree of application in aluminum. Almost half of the book is spent on milling and turning.

The coverage of each subject is thorough in that it starts with a description of the types of machines available and the cutting tools that are suitable. Then data are given

BARNESDRIL

Magnetic COOLANT SEPARATORS



give you these features for Practical COOLANT CLEANING

✻ AUTOMATIC — The Separator requires no attention other than periodic emptying of the sludge pan.

INTENSE MAGNETIC POWER — coolant flow is restricted to intense magnetic field so that more ferrous material, entrained abrasives and other foreign matter is removed per minute per gallon than by any other method.

DOUBLE CLEANING ACTION — magnetized particles form a fan-shaped pattern on the surface of the magnetic drum which serves to "comb out" free abrasive or other materials as the drum rotates.

RAPID SEPARATION — coolant is processed rapidly, flowing by gravity through the separator, for effective circulation at all times. No additional coolant supply necessary to compensate for the cleaning operation.

See your Barnesdril representative or write for Catalog 3004.

Barnesdril Automatic Coolant Separators remove swarf, sludge and abrasive particles automatically from soluble and oil coolants. Built in ten sizes — 1½, 3, 5, 10, 20, 30, 70, 100, 280 and 350 gallons per minute capacity.

COOLANT BARNESDRIL CLEANING

BARNES DRILL CO.

830 CHESTNUT STREET • ROCKFORD, ILLINOIS

Precision gears
custom-made by Perkins
meet your specs
and *your time-table*

Throughout industry, the name PERKINS in association with GEARS has long been symbolical with quality and service. Hence — be they washing machines or supersonic aircraft engines — if the component gears of the finished product are *custom-made by Perkins*, they will be *better* products. *You furnish the specifications, we'll produce the gears!*

PERKINS MAKES *in all materials, metallic or non-metallic, and in any size, to your specifications:* helical gears, bevel gears, sprockets, ratchets, worm gears, spur gears with shaved or ground teeth, ground thread worms.

NOTE: The **PERKINS PRECISION SPRING COILER** is the latest development in the spring coiler field and eliminates entirely the use of arbors and long set-up time. It is a complete self-sufficient machine and enables you to make the spring you want *when* you want it — in seconds. The coiler produces any type of spring, in any diameter and any pitch with this range: Wire Sizes .005 to .125. Diameter from 3/32" to 12" and larger. Size of the compact coiler is only 7½ x 16". **A POWER MODEL** mounted on a welded steel console cabinet base is also available. Full information on request.

Perkins Machine & Gear Co.
101 CIRCUIT AVE., WEST SPRINGFIELD, MASS.

on machining characteristics of the various alloys, including speeds, feeds, and depths of cut that have been found successful. Finally there is a discussion of special machines or practice that may be required in special cases.

•

FORGING AND WELDING—*By Robert E Smith, Emeritus Professor of Education, Ohio State University. Published by McKnight & McKnight Publishing Co, Market and Center St, Bloomington, Ill. 160 pages, 7x10. Price $3.50.*

This is a basic text on blacksmithing and manual welding (both gas and arc). The book is carefully divided into units to fit the developing skills of an apprentice and each new step is clearly illustrated, usually with line drawings. Instructions are written in a brief, straightforward manner, with proper emphasis on safety precautions.

The book should prove useful as a beginning text in these fields. It makes no attempt to deal with the more complex forms of forging that require power hammers or presses. It does deal briefly with machine flame cutting, but most of the welding information is also on the basic level.

Names in the News . . .

Fred E Parker, Jr, has been named manager of Chrysler Corp's Indianapolis PowerFlite transmission plant. He has been serving as administrative assistant to the plant operating manager. **James R Cypher,** master mechanic at the new Kokomo transmission plant, has been appointed plant manager. **F E Parker, Sr,** has been named operating manager there.

C O Donley, chief engineer, bearings operations, for General Motors Allison Division, has been named chief engineer at the Diesel Equipment Division, Grand Rapids. **William J Purchas, Jr,** who held the post to which Mr Donley has been named, takes over the latter's former duties.

Clarence P Sander, general superintendent, Vernon Plant, Consolidated Western Steel Division of US Steel Co, has been elected first vice president; **Gustav O Hoglund,** head of

McKay's *Flex-Roll Processor*

Conditions steel prior to fabricating to eliminate stretcher strain, minimize tearing

THE NATION'S foremost metal fabricators, including all the leading automotive manufacturers have proved the McKay Flex-Roll Processor to be the finest equipment of its kind available to industry today.

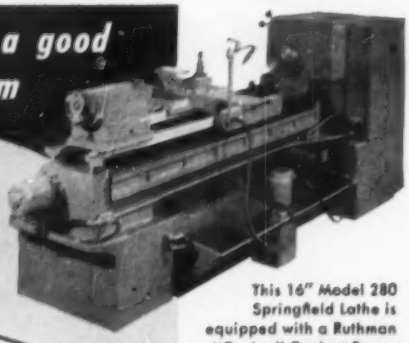
If you are doing any amount of deep drawing, you cannot afford to be without the services of this amazing unit. Let our sales engineers put you in contact with a user in your area . . . a few minutes of your time will convince you of its value. ***The McKay Machine Company, Youngstown, Ohio.***

McK

SETTING THE STANDARDS OF QUALITY IN METAL WORKING MACHINES FOR TWO GENERATIONS

7702

The Heart of a good Coolant System

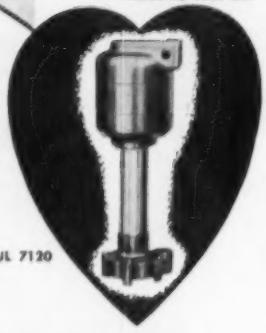


Ruthman GUSHER Coolant Pump

This 16" Model 280 Springfield Lathe is equipped with a Ruthman "Gusher" Coolant Pump. Photo courtesy Springfield Machine Tool Co.

Yes, a "Gusher" Coolant Pump is truly the heart of a *really good* Coolant System.

A "Gusher" gives you split-second coolant flow without priming. Its simple design eliminates the need for packing, foot or relief valves and it requires less power when throttled. The dynamic balancing of the entire rotating assembly minimizes vibration. The rugged construction with over-sized pre-lubricated ball-bearings reduces attention to a minimum. The result is a *better*, more dependable performance for all "Gusher" Coolant Pumps.



MODEL UL 7120

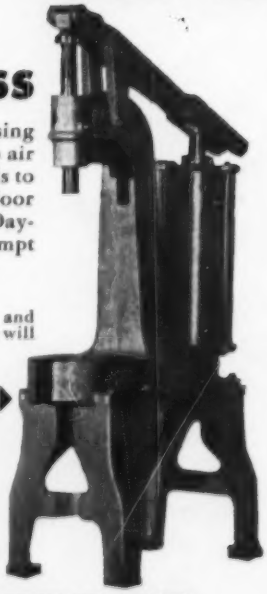
THE RUTHMAN MACHINERY CO.

1818 Reading Road Cincinnati, Ohio

SAVE!

WITH A HANNIFIN AIR PRESS

It's the ideal press for that occasional pressing job. These presses operate off ordinary shop air supply. They're fast and safe. Over 30 models to choose from...many for either bench or floor mounting. Capacities from ½ to 18 tons. Daylight to 46 inches...reach to 12 inches. Prompt delivery.



WRITE. Complete information and prices on Hannifin Air Presses will be sent on request.

6 Tons (Model B-2) One of more than 30 models. Press with base, $519.

1-ton Hand - D - Press. For small parts manufacturers. Press only, without valves, $232.

Prices F.O.B. our press plant, St. Marys, Ohio, subject to change without notice.

HANNIFIN

HANNIFIN CORPORATION, 511 S. WOLF ROAD, DES PLAINES, ILLINOIS

the welding section of Aluminum Co of America's process development laboratory, has been named second vice president.

John J Chyle, director of welding research, A O Smith Corp, has been named president of the American Welding Society for 1956-57.

Joseph Montgomery, in charge of foreign sales for Elox Corp of Michigan, has been appointed general sales manager for the company.

Melvin J Totz, secretary-treasurer of the Motor City Tool Co, Detroit, has been elected president of the Detroit Council of the National Tool & Die Manufacturers Assn. He succeeds **David J Bathgate**, Oval Tool & Die Corp.

Austin Kuhns, vice president and chairman of Farrel-Birmingham Co's finance committee, has been named senior vice president of the company.

O Jules Poupitch, inventor, and a member of the Research & Product Development Division of Illinois Tool Works, has been named product development consultant for both of the company's fastening divisions. Shakeproof, and the recently established Fastex Division.

Harold Ruehl has been named chief engineer for Erickson Tool Co, Cleveland. Formerly assistant, he succeeds the late **Robert F Jacobs.**

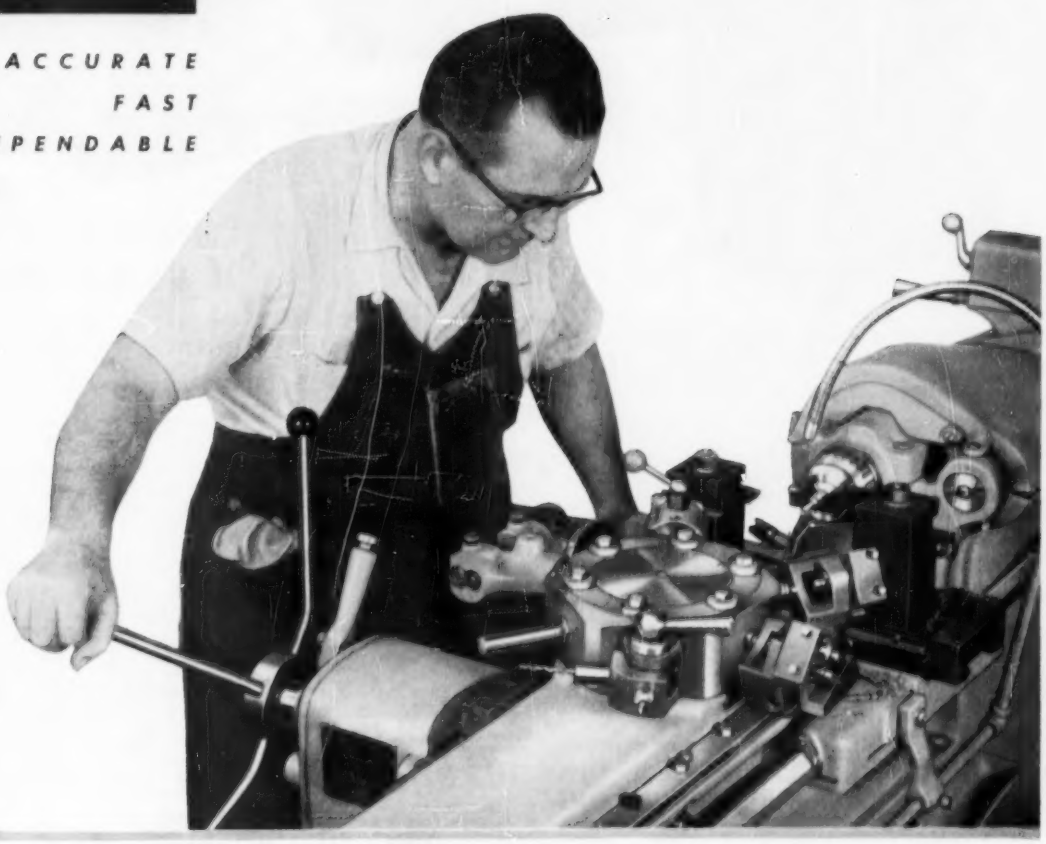
Richard F Gibbons has been appointed general manager of the Gardner Transformer Division of Federal Pacific Electric Co at Emeryville, Calif. He was formerly manager of air switchgear engineering, Pacific Switchgear Division, Santa Clara.

Fred L Schwab has been named general sales manager of Phillips Control Corp, Joliet, Ill, subsidiary of the Thor Corp. He has been in charge of eastern division sales, New York. **Stanley McClean** has been appointed to direct production activities for the two Joliet plants and the Puerto Rico facility.

Herbert O Patchel, Jr, formerly associated with Rheem Manufacturing Co as works manager, has been named a vice president and assistant to the president of Babb Co, manufacturer of aircraft parts and accessories, with headquarters in Phoenix, Ariz.

New 13" PRECISION TURRET LATHE

ACCURATE
FAST
DEPENDABLE



HARDENED BED WAYS

Hardened and precision ground bed ways can be supplied in lieu of regular at small extra cost—also hardened and ground cross-feed screw.

The production of small parts requiring both exacting tolerances and high output calls for this new turret lathe. In it has been combined machining speed, handling ease, accuracy and rigidity for utmost efficiency on every job.

Its exceptional ranges of facing, turning, ram and threading feeds are a match for every machining condition. Handling is fast and easy as excess weight has been avoided. Time-proven design and careful workmanship give it accuracy for years to come.

Send for complete information if you are interested in producing more precision parts at lower costs.

SPECIFICATIONS: Swing 13⅛" • Collet capacity 1" • Spindle bore 1⅜" • Turret ram effective feed 6½" • Turning feeds 48 • Facing feeds 48 • Threading feeds 48 • Turret feeds 144 • Spindle speeds 12 • **Prices start at $2,344.**

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South Bend Lathe, South Bend 22, Indiana: Send information on 10", 13" and 16" Turret Lathes, —Engine and Toolroom Lathes, —Milling Machines, —Shapers, —Drill Presses, —Pedestal Grinders.

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ECONOMY *Automatic*
POINTING MACHINES
for bolt and cap screw pointing

TYPE 4600

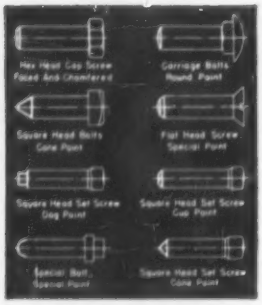
ECONOMY Automatic Pointing Machines are hopper fed and automatic in operation. These features enable operator to run several machines resulting in greater productivity and lower costs.

These Automatic Pointers are available in two sizes—Type 3300 for uniformly pointing bolts and screws to 3/8" diameter and 3/4" to 3-1/2" in length, the type 4600 for pointing bolts and cap screws 1/4" to 3/4" diameter and 1" to 6" in length. A single machine will handle all types of points on many types of bolts and cap screws.

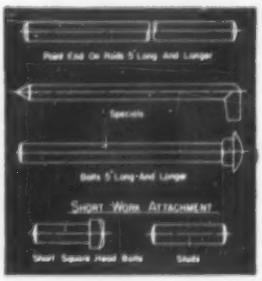
Production rates of the type 3300 vary infinitely from 2,000 to 6,000 finished parts per hour and on the type 4600 from 1800 to 5400 per hour.

Also available is the type "P" Semi-Automatic Pointing Machine for pointing bolts, cap screws, studs and rods 1/4" to 1-1/2" diameter, 5" or more in length. Production rates up to 2,000 pieces per hour make it a valuable secondary machine for short runs.

Consult ECONOMY on low cost, high production Bolt and Screw Pointing operations.


Hex Head Cap Screw Faced And Chamfered
Carriage Bolts Round Point
Square Head Bolts Cone Point
Flat Head Screw Special Point
Square Head Set Screw Dog Point
Square Head Set Screw Cup Point
Special Bolt Special Point
Square Head Set Screw Cone Point

Typical parts machined on the TYPE 4600



Typical operations performed on TYPE "P" Semi-Automatic Pointing Machines

THE ECONOMY LINE

Automatic Shaving Machines
Automatic Pointing & Shaving Machines
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Automatic Pointing Machines
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WILLOUGHBY, OHIO
Designers and Manufacturers of Secondary Operation Machines since 1915

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Mfrs. since 1911

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Portable Nibbler Cuts 10 Ga. Stainless Steel

Above you see Fenway's new Heavy Duty Nibbler cutting through a piece of 10 ga. stainless steel. On milder steels or non-ferrous, it will handle 8 ga. with ease.

Cutting action is provided by a patented, tool-steel punch and die that bites out a ¼" slug of metal with each stroke, leaving a clean cut, without distortion on either side. Full load cutting speed is 24" a minute. Minimum cutting radius is 6".

Portable, versatile, maneuverable, the Fenway Nibbler is ideal for following templates or patterns. It also cuts corrugated stock or holes in tubes or ducts without distorting original contour.

If a tool like this could save money or solve a problem for you, then write today for more information on Fenway Model HN Heavy Duty Portable Nibbler.

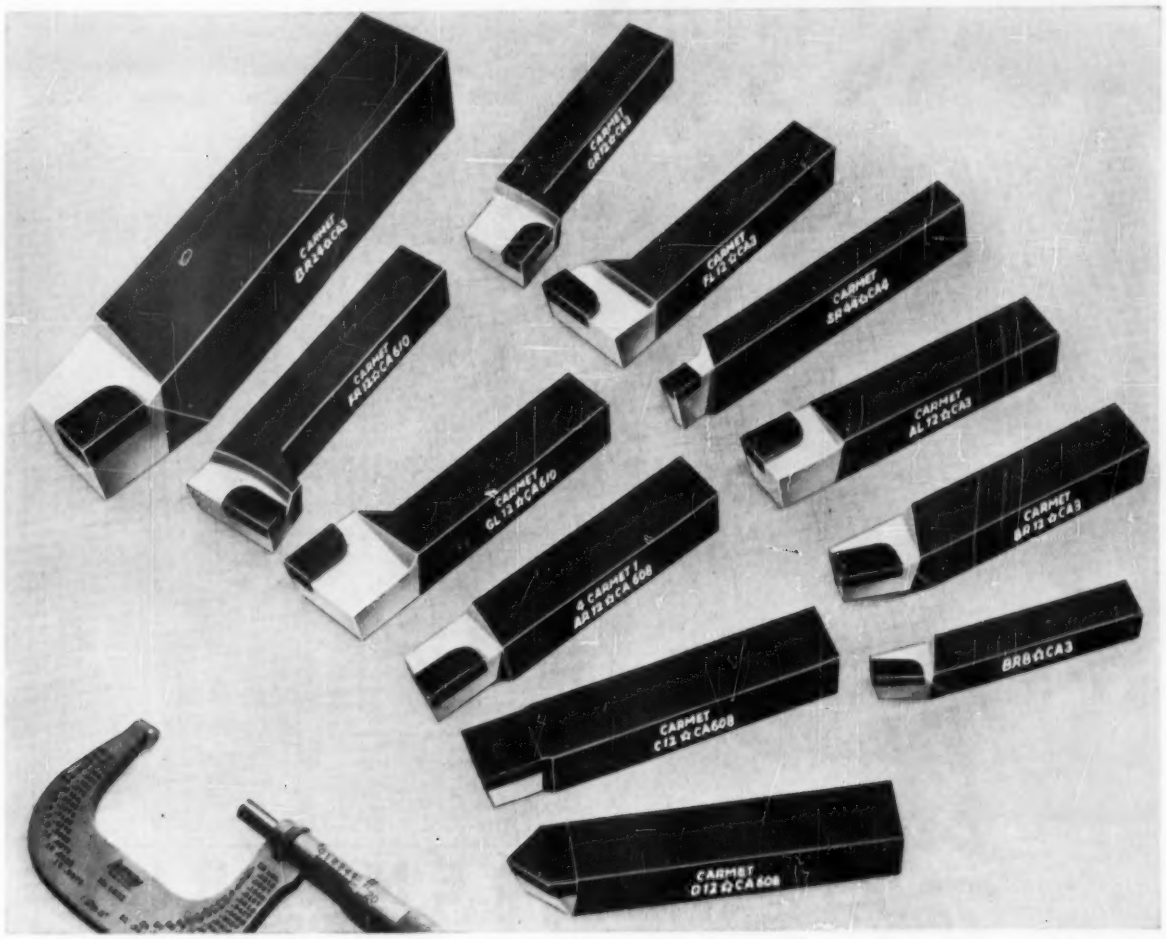
14 and 18 gauge models

For working lighter sheet, Fenway offers Models MN and LN. Model MN is rated for 14 ga. stainless* and cuts at 36" a minute full load, with min. cutting radius of 1". Model LN, rated for 18 ga. stainless*, cuts 43" a minute; min. radius ¼". All Fenway Nibblers are unconditionally guaranteed.

*Softer metals in proportionately heavier gauges.

Write for Catalog Sheets and Prices

FENWAY MACHINE COMPANY
Edgemont & Clementine Sts.
PHILADELPHIA 34, PA.



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We specialize in precision preforming of Carmet carbide metals to *any* shape for special wear-resistance needs, such as dies, gage blanks, etc. Let us quote on *your* requirements.

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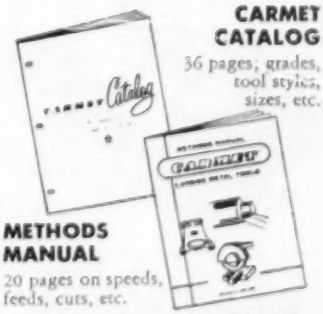


CARMET CATALOG
36 pages; grades, tool styles, sizes, etc.

METHODS MANUAL
20 pages on speeds, feeds, cuts, etc.

ADDRESS DEPT. AM-76

The Allegheny Ludlum line of Carmet Carbide Tools is *complete*—every style, size and grade you may need for any cutting job in the shop. If you make your own tools, a full line of blanks is available, too—as well as all necessary grades of AL Tool Steels for back-up materials. Extensive stocks of Carmet standard tools and blanks are carried in Distributors' warehouses coast to coast, and special tools are available to order. • Just remember, for best performance on any application, *use Carmet! Allegheny Ludlum Steel Corporation, Carmet Division, Wanda and Jarvis Aves., Detroit 20, Michigan.*

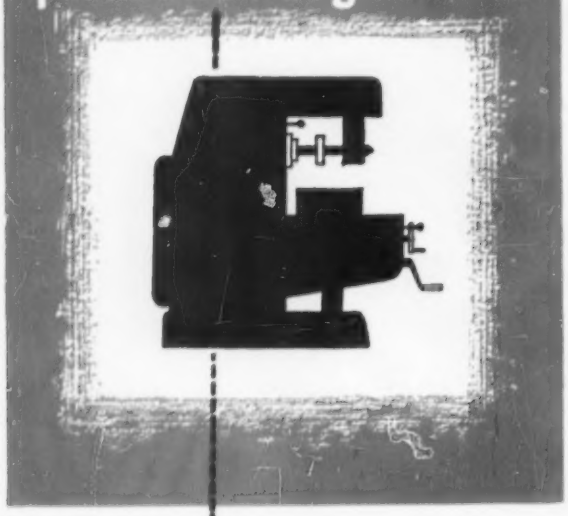
For ALL your CARBIDE needs, call

Allegheny Ludlum

WAD 5570 B

AL® FINE TOOL STEELS SINCE 1854

production begins with



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No tools like the right tools! Columbus Die-Tool designs and builds tools, jigs, fixtures and special machinery to meet your most exacting requirements. RESULTS: operating cost that matches your budget; production that matches your schedule; product quality that matches the demands of your market.

Contact Columbus Die-Tool & Machine Co. first—when you have a special machine problem. They are nationally known as expert designers and builders of special machinery and equipment . . . have been for over 50 years.

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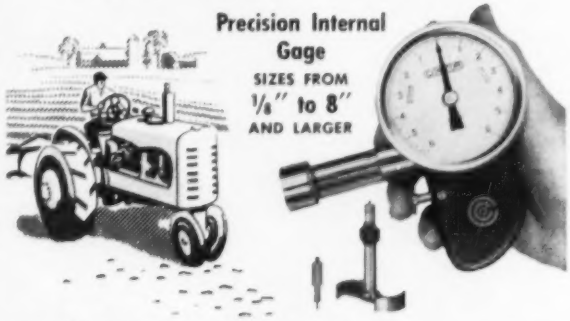
Did you know that – – –

Leading farm machinery makers rely on this precision gage.



COMTORPLUG with interchangeable expanding plugs to gage simple or special bores from 1/8" to 8" dia.

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Positive gaging accuracy to fraction of .0001" regardless of who operates it.
Indicates actual size, a fixed—not passing—reading.
Positive 2-point gaging—automatic centering.
Shallow holes, deep holes, inside splines, open-end holes gaged easily.
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A shop tool for all-day every day use.
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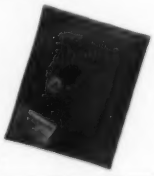

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Special Machinery
HEBERT Equipment Co. • Romeo, Mich.

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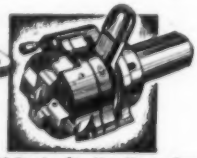

famous for accuracy and straightness of threads, low chaser costs, less downtime, more pieces per day.

THE EASTERN MACHINE SCREW CORP., 30-40 Barclay St., New Haven, Conn.
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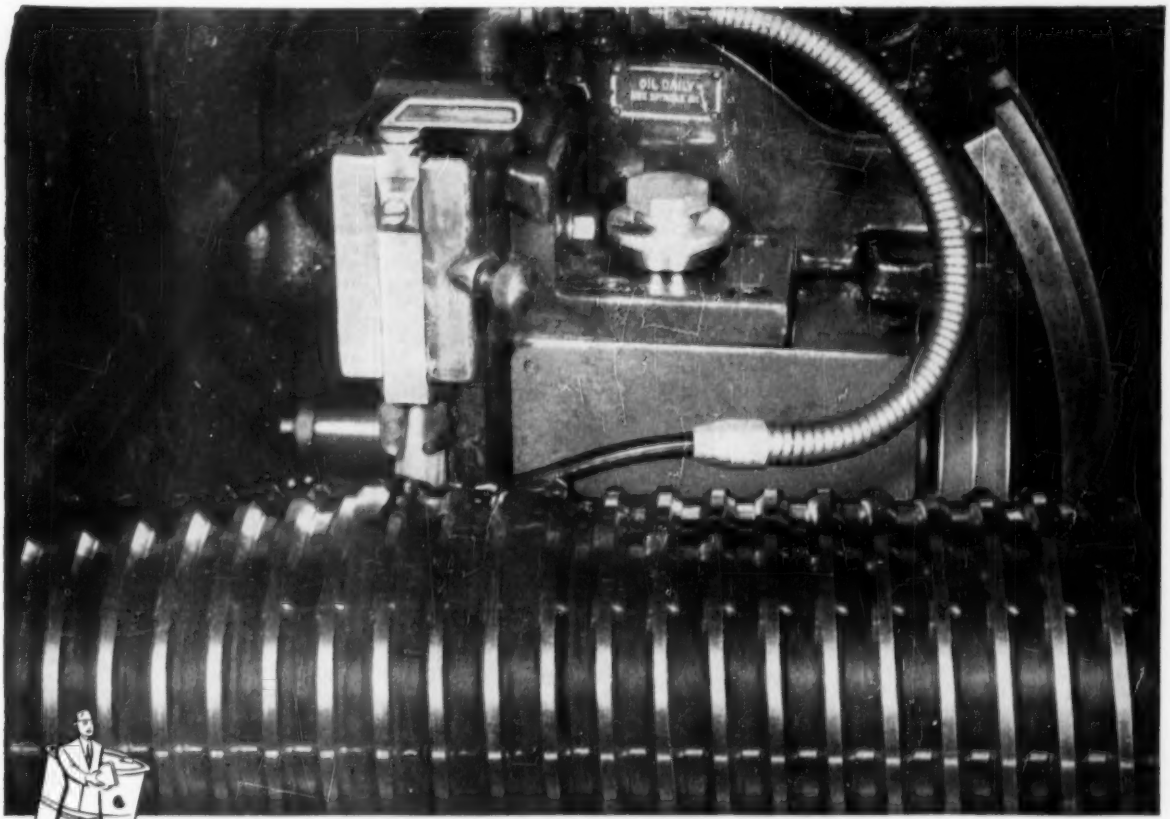

Ask "the Man in the Barrel" to tell you how . . .

A Grinding Oil can *make* or *break* precision grinding jobs!

If you're using *just a coolant* or any oil that happens to be handy for those precision grinding jobs . . . it's costing you money!

A grinding oil can make or break a precision grinding job such as thread grinding, gear grinding and many types of form grinding. Grinding oils are usually classified as "hard-acting" or "soft-acting" depending on how they affect grinding wheel hardness. Grinding oil characteristics must be closely co-ordinated with wheel characteristics, speeds, feeds, and material machinability and hardness to obtain maximum performance.

When form grinding low hardness materials, where wheel form is important, a "hard-acting" oil helps to maintain proper wheel form by making the wheel act harder. As a result, greater wheel life is obtained and more accurate parts are produced.

When a high hardness material is being ground there is a tendency for the wheel to load-up and glaze. Such a condition is the cause of burnt work surfaces and heat checks, and is often encountered when grinding taps, gauges and other hardened parts. A "soft-acting" grinding oil will make the wheel act softer, opening up the wheel and exposing new abrasive grains to do the work.

Stuart's complete line of grinding oils have been chemically balanced and scientifically tested to meet the demands of various types of precision grinding operations. "The Man in the Barrel," your trained Stuart Representative, will be happy to assist you in selecting the proper grinding oil for your particular needs. Ask to have him call . . . and ask for a Stuart's Precision Grinding Oil Bulletin, too.

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Time Tested Cutting Fluids and Lubricants

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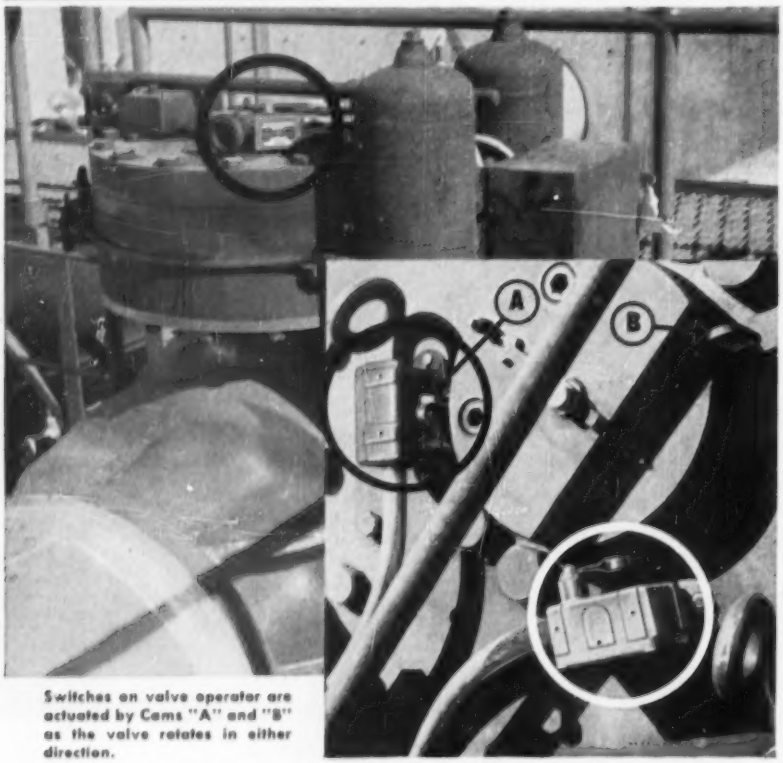
MICRO precision switches

...THEIR USE IS A PRINCIPLE OF GOOD DESIGN



Switches on valve operator are actuated by Cams "A" and "B" as the valve rotates in either direction.

Explosion-proof switches provide automatic control on valve operator

MICRO SWITCH explosion-proof switches were installed on the gas valve operator by the engineer of a Texas gas company to provide safe and automatic control.

Two switches were placed so that they may be operated by cams as the valve rotates in either direction. The switches control the gas supply and turn on indicating lights when the valve is turned to either extreme position by the pressure of natural gas which it contains. The valve-operator is electrically controlled but is powered by gas.

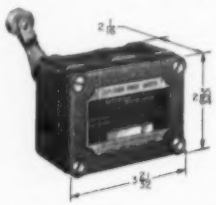
Double-pole, double-throw switches are used because each switch is required to perform two functions. When the valve reaches either limit, one of the switches is actuated to open or shut off the supply of gas and turn on a light on the control panel, which shows the position of the valve.

Explosion-proof switches are used to insure that no escaping gas will be ignited when electrical contact is made.

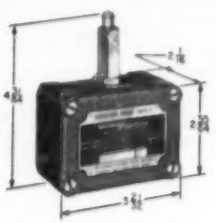
This installation is typical of thousands of such uses, which plant operating men, plant engineers, and maintenance superintendents are making of MICRO precision switches on present plant equipment. Production is increased by making machinery more automatic. Both operators and machines are protected when switches are used to prevent premature operation of equipment.

MICRO SWITCH Explosion-proof Switches (EX Series)

MICRO SWITCH "EX" Series of explosion-proof switches are listed by Underwriters' Laboratories for use in hazardous atmospheres of Class I, Group C (ethyl ether vapor) and Group D (gasoline, petroleum naphtha, alcohols, acetone, lacquer solvent vapors and natural gas); Class II, Group E (metal dust), Group F (carbon black, coal or coke dust), and Group G (grain dust)



This switch, which is shown in action in the gas company installation, is designed for cam or slide operation. The actuator arm is operated by clockwise rotation and is adjustable through 360°. Standard contact arrangement is single-pole, double-throw.



This push-rod plunger switch is designed for use as a limit switch on in-line motion applications. A stop ring near the plunger tip limits the overtravel and permits a steady load of as much as 100 pounds on the plunger without injury to the enclosed precision switch. Standard contact arrangement is single-pole, double-throw.

ELECTRICAL RATINGS

15 amperes 125, 250 or 460 volts a-c; ½ ampere 125 volts d-c; ¼ ampere 250 volts d-c.

Other explosion-proof switches in the MICRO "EX" Series include a cross roller lever switch for use where the operating mechanism approaches from a direction perpendicular to the longitudinal axis of the switch. The switch is also available with a large paddle-shaped actuator for manual control of power equipment.

Send for Catalog 101 "Switches for Indu[illegible]y"

MICRO SWITCH distributors are located in key cities everywhere. They have full stocks of switches for plant use applications. Look in the Yellow Pages under "Switches, Electric."

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A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

In Canada, Leaside, Toronto 17, Ontario • FREEPORT, ILLINOIS

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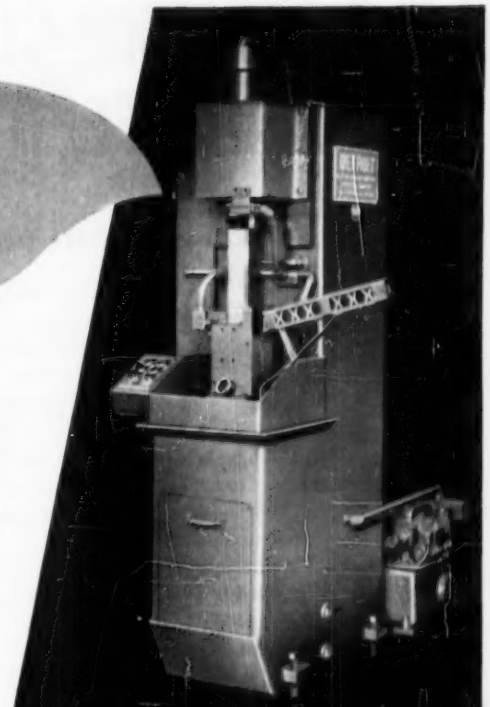
broaches oil groove in

700 BEARING RACES/Hr.

This application shows the versatility of Detroit Broach standard presses. Tooled for automation, parts are magazine fed from the preceding operation, broached and then dropped into a tote basket ***without an operator.*** Parts can also be chute-fed to next operation.

An important advantage of this type of automation lies in the fact that if the operation should be obsoleted, this standard press can be applied, without change, to another operation.



Detroit Broach standard 1-ton, 12" stroke, Gooseneck press.

Detroit Broach standard 10-ton, 30" stroke, Side Plate press.

STANDARD DETROIT PRESSES

for BROACHING ★ ASSEMBLING ★ STRAIGHTENING

- ★ Complete range of sizes and strokes in both Gooseneck and Side Plate presses.
- ★ Sensitive, positive control of ram speed, force, travel and direction of movement.
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- ★ Simple manual, semi-automatic or fully automatic control.
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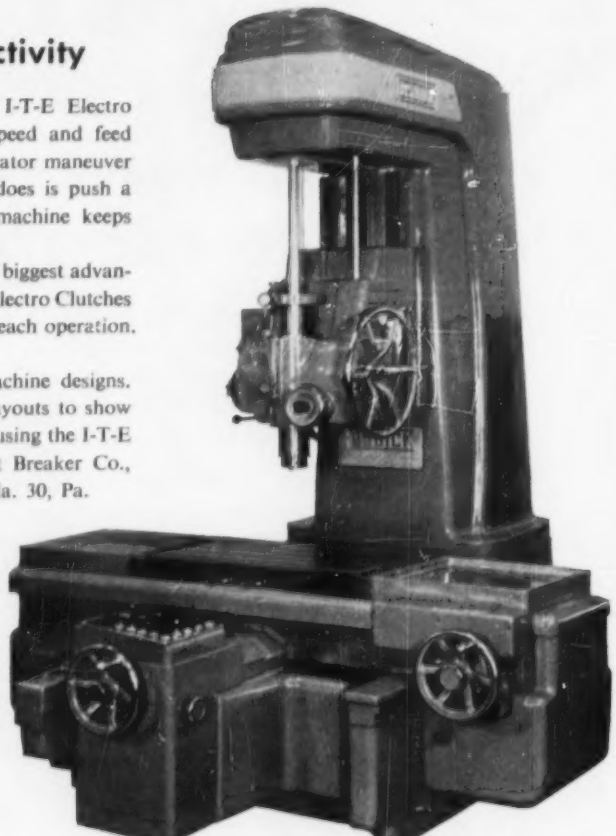
I-T-E ELECTRO CLUTCHES MAKE POSSIBLE SPEED AND FEED CHANGES IN 1/2 SECOND

Easier operation boosts productivity

The Fosdick Machine Tool Co. has now incorporated I-T-E Electro Clutches into its precision jig borers. Formerly every speed and feed change meant the machine had to be stopped and the operator maneuver a mechanical slide-gear shifting mechanism. Now all he does is push a button on the conveniently located control panel. The machine keeps running; keeps producing.

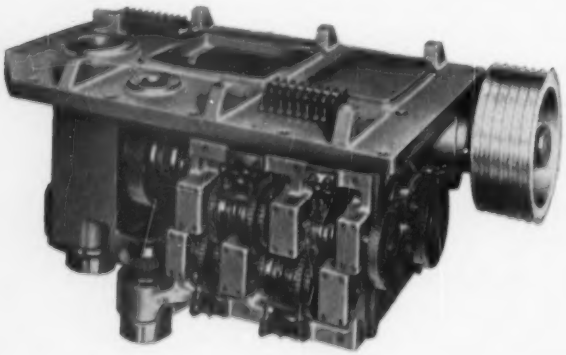
Easier operation and increased production—these are the biggest advantages that I-T-E Electro Clutches can add to machine tools. Electro Clutches make it easier to operate machines at their best speeds for each operation. In addition, they have transmission gear space.

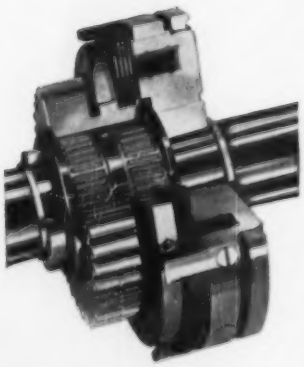
I-T-E Electro Clutches are available to fit existing machine designs. I-T-E application engineers will be glad to help prepare layouts to show you the space-saving possibilities and ease of control when using the I-T-E Electro Clutches. Write for Bulletin #5306. I-T-E Circuit Breaker Co., Transformer-Rectifier Division, 19th & Hamilton Sts., Phila. 30, Pa.



FOSDICK PRECISION JIG BORER
MODEL H-1015

SPACE SAVER. Complete transmission for the Fosdick machine. Notice compactness and simplicity for mounting I-T-E Electro Clutches on same shafts with gears. Clutches operate right in housing with oil lubricant.





NO ADJUSTMENTS. The I-T-E Electro Clutch is simple, compact, requires no adjustments for wear. Available in torque ratings from 3.2 ft. lb. to 45,000 ft. lb.

I-T-E

I-T-E CIRCUIT BREAKER COMPANY • **Transformer-Rectifier Division**

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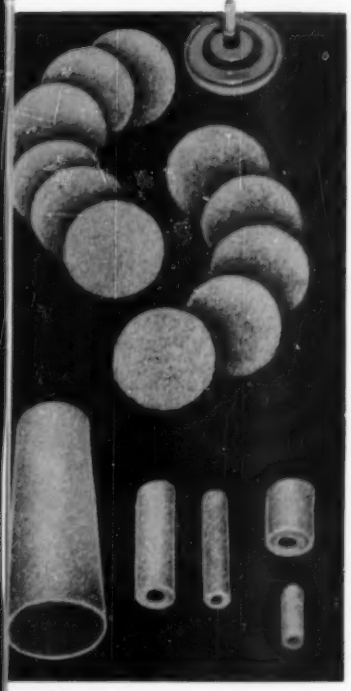

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for **sharper** cutting...
for **cleaner** cutting...
for **smoother** finishing...

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feel the difference...
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the difference—

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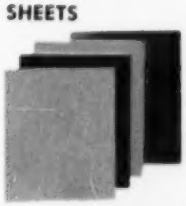

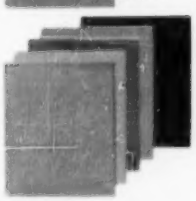

Michigan

ABRASIVES

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RED COAT BRAND

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Manufacturers of

'The Humidity-Controlled Abrasive'

DETROIT 5, MICHIGAN

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from wide belts like this to small specialties!

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PROOF we can PROVE the difference

AND WE CAN ACTUALLY PROVE THE DIFFERENCE in your plant or shop . . . to your conditions and specifications!

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One of our abrasive engineering specialists will bring proper abrasive products, show you how much more quickly and cleanly stock is removed . . .and finished to your specifications!

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Smoother finishing

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If you want to be *sure* you are putting the right bearing in the right place in your product, check with SKF — the *one* bearing manufacturer selling all four major types of anti-friction bearings. From this single source, you quickly and easily get unbiased advice based on the broadest experience in the anti-friction field. **SKF INDUSTRIES, INC.**, PHILADELPHIA 32, PA.

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TRADE-MARK

CUTS ALUMINUM AT SPEEDS UP TO 300 INCHES PER MINUTE

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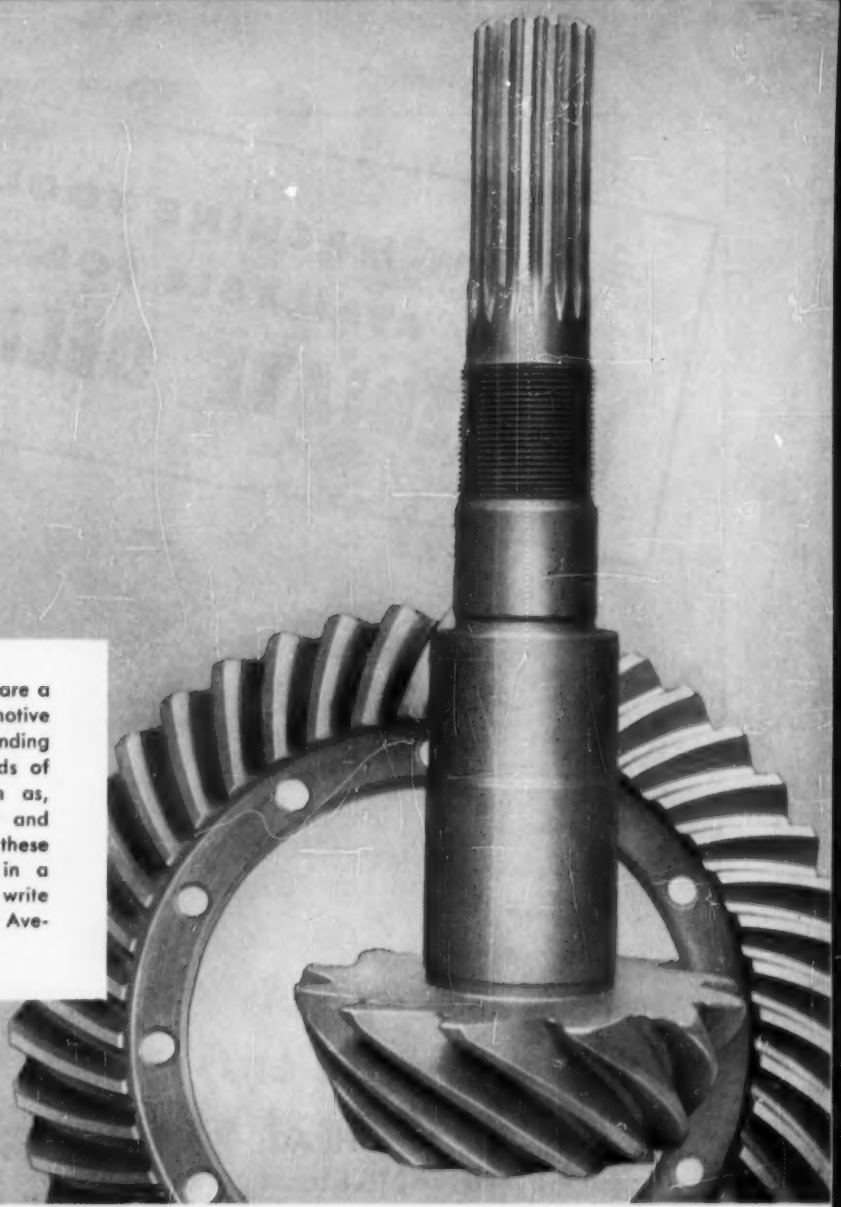

Moly carburizing steels with 0.5% Mo are a natural for components like this automotive ring-gear and pinion. They have outstanding properties that suit them to the demands of gearing and similar applications, such as, superior case hardness, low distortion and good machinability. Many features of these new carburizing steels are discussed in a recent technical article. For a reprint, write Climax Molybdenum Company, 500 Fifth Avenue, New York 36, N. Y., Dept. 12.

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Design engineers know moly steels for their uniform hardenability, toughness and wear resistance.

Production men know that moly steels are easy to heat treat, easy to machine.

Management knows that moly steels mean economy in fabrication, high performance in a wide range of end products.

Standard molybdenum carburizing steels are widely available. Higher moly analyses may be ordered in heat lots from a number of leading suppliers.

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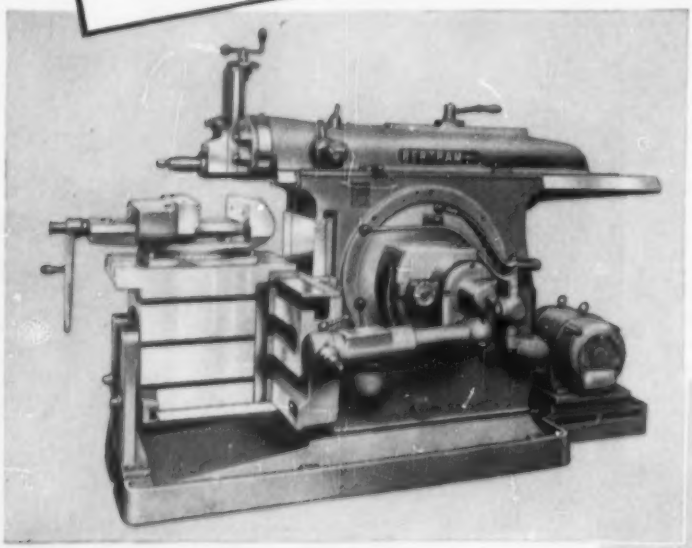

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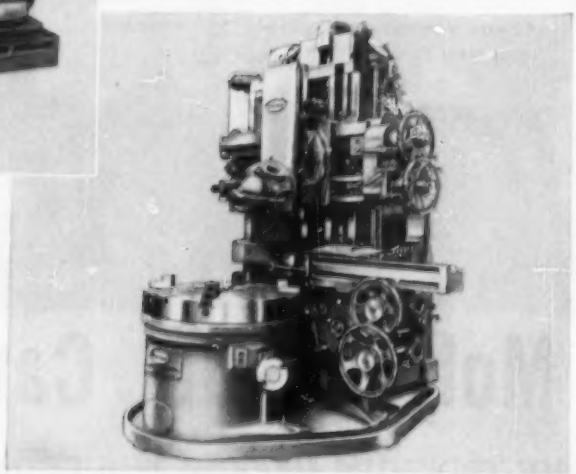

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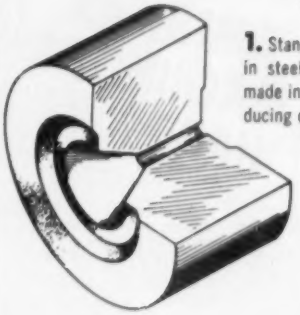
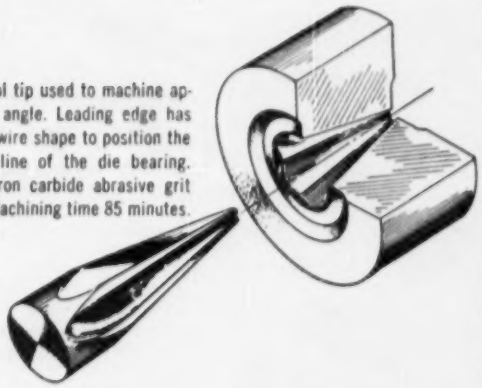
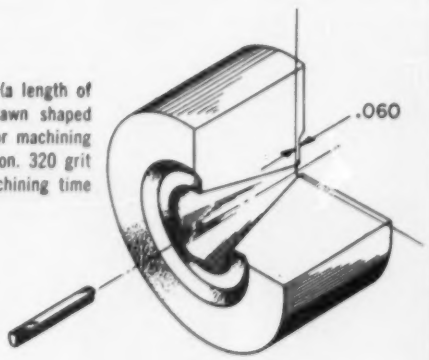


1. Standard rough-cored carbide nib in steel casing as supplied. To be made into a wire drawing die for producing ess shaped trolley cable wire.



2. Tool tip used to machine approach angle. Leading edge has an ess wire shape to position the center line of the die bearing. 320 boron carbide abrasive grit used. Machining time 85 minutes.



3. Tool tip (a length of previously drawn shaped wire) used for machining bearing section. 320 grit abrasive. Machining time 5 minutes.

4. Completed die. Mat finish produced requires only 25 minutes to obtain mirror polish. Tolerance ±.0003" Made by conventional methods cost—up to $300. Produced on Raytheon Impact Grinder —$60 (including tools).

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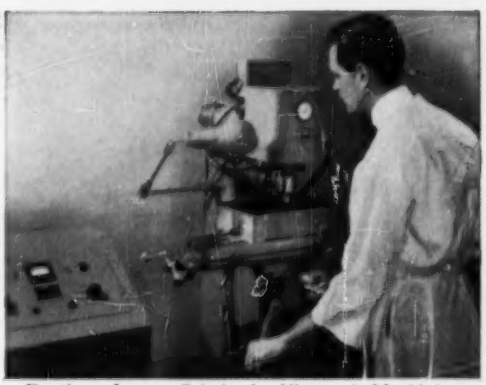

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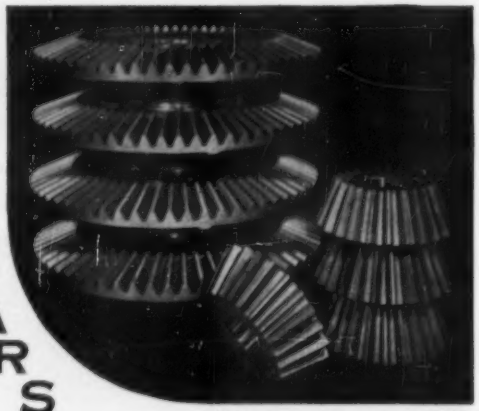

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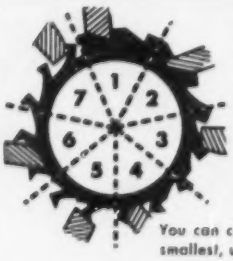

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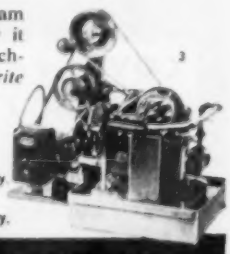

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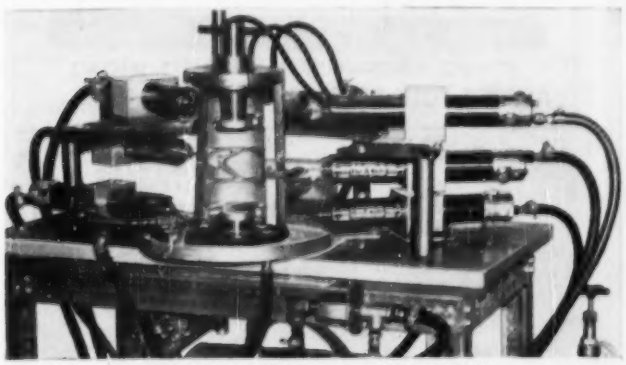

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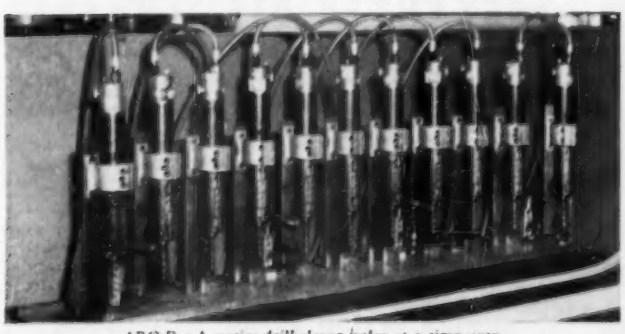

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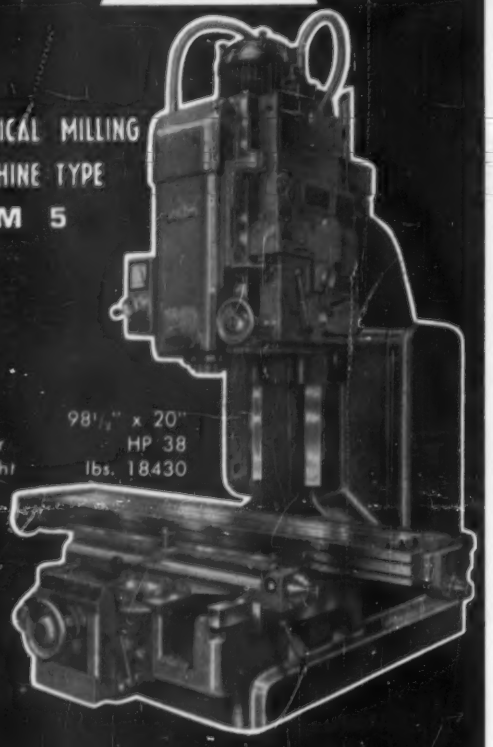

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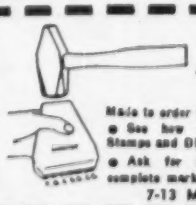

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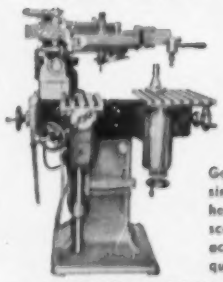

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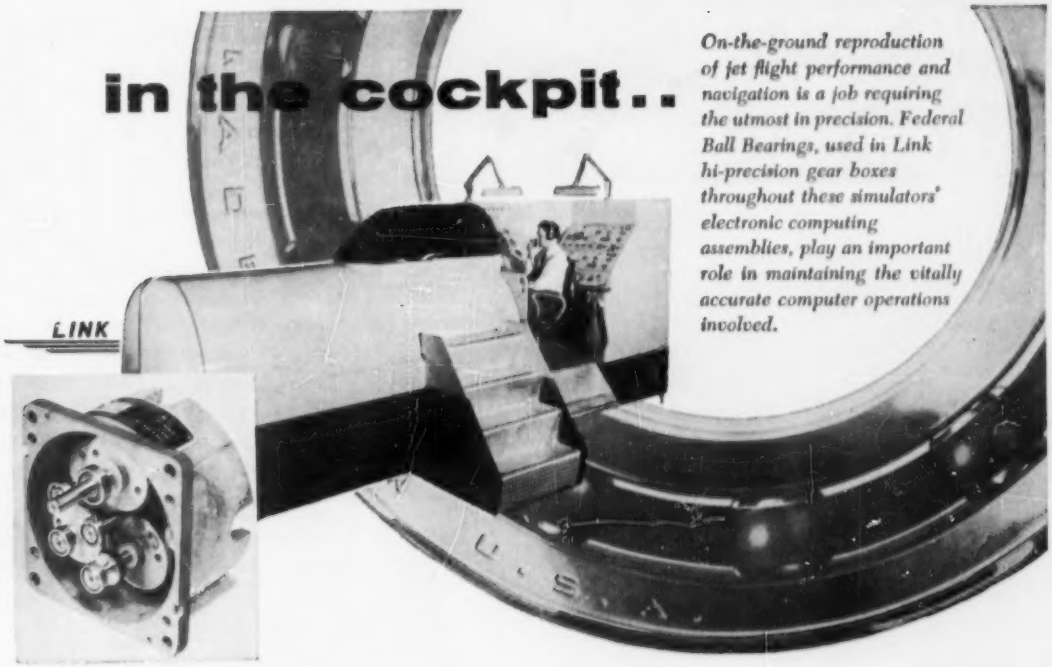

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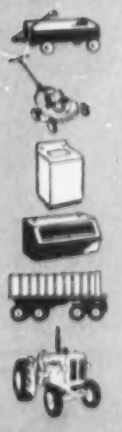


in these and hundreds of other applications where stress, wear or vibration is a factor. The Gripco Lock Nut, with its simple, one-piece design, has given industry a tighter, more positive holding action for quicker fastener application at less initial cost. No inserts, outside devices or complicated features – the Gripco Lock Nut holding or locking action is inherent in the nut itself – it costs less to use, gives an easier, faster locking and holds tighter for a longer time. Impervious to oil or water. For faster production, lower manufacturing and maintenance costs, look into the Gripco Lock Nut today.

GRIPCO PRODUCTS INCLUDE: Gripco Lock Nuts, New Gripco "Clinch" Nuts, Gripco Hi-Nuts, Gripco Pilot-Projection and Countersunk Weld Nuts with or without Gripco locking feature.

112

GRIP NUT COMPANY

310C S. Michigan Avenue, Chicago 4, Illinois

A SPECIALIZED CAM MILLING SERVICE
Over 100 Types of INDEXING TURNTABLES
Also Geneva Gears, Spot and Butt Welding, Positioners for Brazing, Surfacing, Welding and Soldering
Contract production. Special automatic machines
CAMS OF ALL TYPES
Charles Eisler Jr., President
EISLER ENGINEERING CO., INC.
738 SOUTH 13TH STREET
NEWARK 3, N. J. U.S.A.

POPE PRECISION SPINDLES for Grinding, Boring, Milling

Belt Driven · Motorized · High Cycle · Special

Let us send you Data Sheets

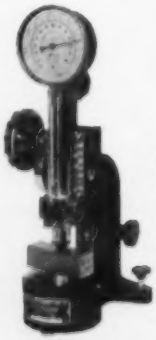
POPE MACHINERY CORP., 261 River St., Haverhill, Mass.

SHORE SCLEROSCOPE HARDNESS TESTERS

Pioneer American Standard SINCE 1907

Available in Model C-2 direct reading or in Model D dial indicating with equivalent Brinell and Rockwell C Herodoss Numbers. May be used free hand or mounted on bench clamp. Sensitive over entire range from softest to hardest of metals without adjustment. Non-injurious to work.

OVER 40,000 IN USE

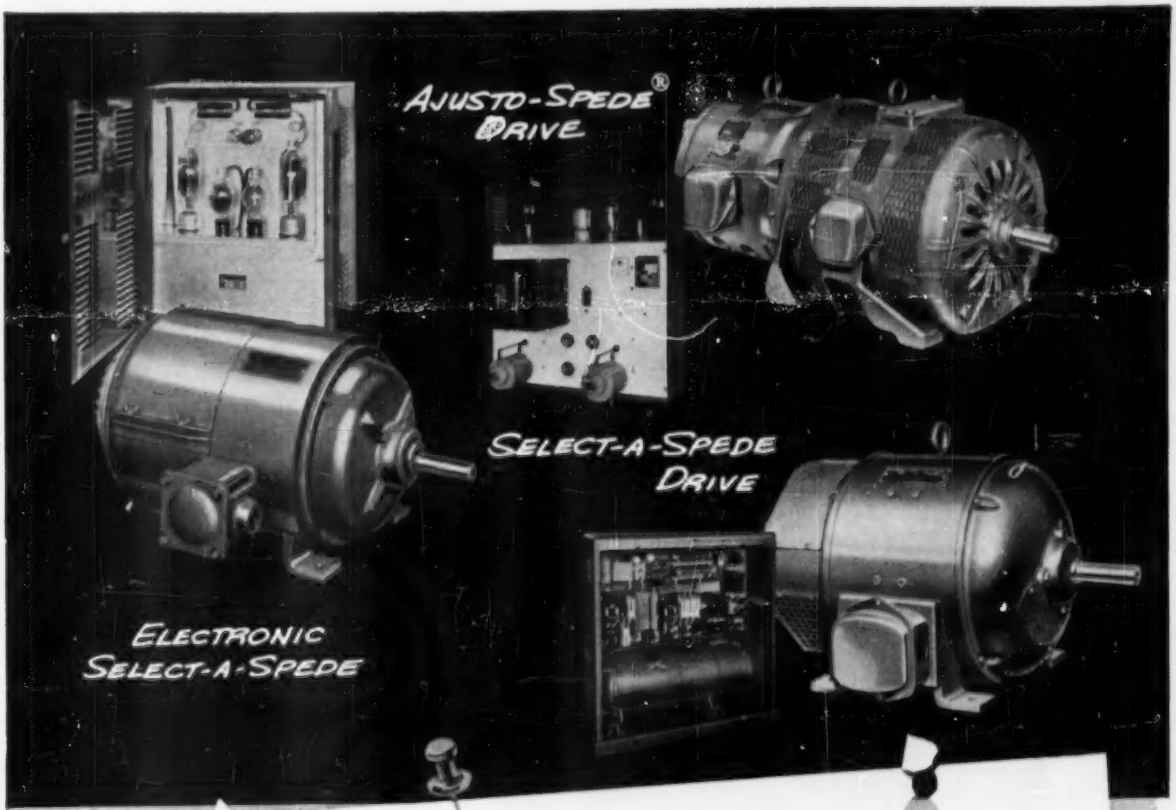


MODEL D

THE SHORE INSTRUMENT & MFG. CO., INC.

90-35B Van Wyck Exp. Jamaica 35, N. Y.

MODEL C-2



Is your adjustable-speed drive problem different?

. . . then it will pay you to look to Louis Allis for the best solution

There are several reasons why it pays to come to us with your adjustable-speed drive problems.

First of all, we have no axe to grind. We can recommend the proper drive for your needs because we make them all. There's no compromising.

Secondly, when you turn your problem over to us, we tackle the whole job . . . assume the entire responsibility.

And finally, we have more than just drives to offer . . . we have engineering and manufacturing experience. We've already solved a lot of drive problems. That's why we can tell you what you need, no matter what kind of machine you have.

And here are the drives that can do the job for you:

Ajusto-Spede® Drives. 1 to 75 hp. Constant torque with up to 10:1 continuous speed ranges available. Infinitely adjustable eddy current clutch drive.

Select-A-Spede Drives. 1/2 to 400 hp. 8:1 constant torque speed range with magnetic amplifier control. Adjustable speed DC drive motor built in any enclosure.

Electronic and Static Select-A-Spede. 3/4 to 15 HP DC adjustable speed drive motor with speed ranges up to 100:1 and regulation to 1/2%.

See your Louis Allis field engineer or write and tell us about your problems. There's no obligation.

Write for latest informative literature describing the above drives, or contact your nearby Louis Allis Sales Office.

ASD-102

THE LOUIS ALLIS CO.
MILWAUKEE 7, WISCONSIN

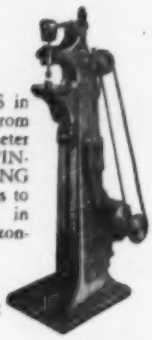
GRANT

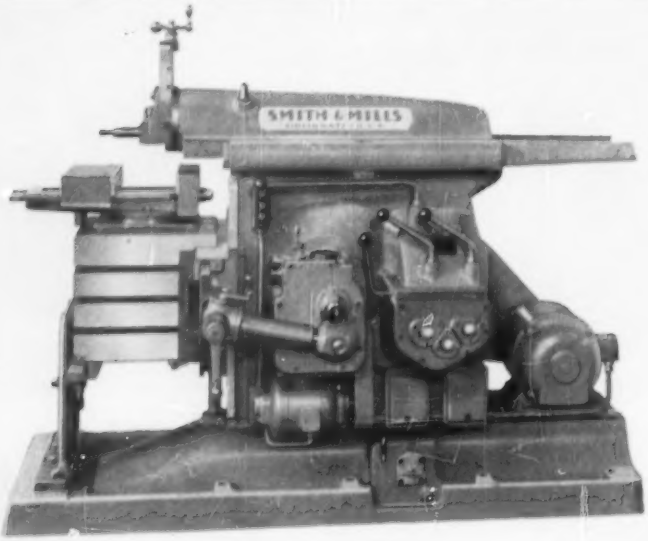
RIVETERS — PIONEERS in their line—head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method — Sizes to meet all needs — Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.

85 Stillman Ave., Bridgeport, Conn., U. S. A.





SMITH & MILLS SHAPERS—

for production and tool room

Compare Smith & Mills with any other shaper for versatility, speed, cutting power and precision performance. *Compare* and you'll *buy* Smith & Mills—famous for high quality shapers since 1888. Write or wire for prices, deliveries, repair parts or field service. Smith & Mills Shaper Division, Nebel Machine Tool Corp., 3407 Central Parkway, Cincinnati 25, Ohio.

Smith & Mills Shapers now available in Heavy Duty Models in 16", 20", 25", 28", 32" and 36" strokes, and Standard Duty Models in 20" and 24" strokes.

Smith AND Mills SHAPERS CINCINNATI

Understanding ALLOY STEELS

By removing the cloak of mysterious, highly technical terminology, this *American Machinist* Special Report clarifies the differences in commonly used alloy steels.

Alloy steel is just plain carbon steel to which one or more other elements are added to change some property or properties of the base material. These elements may affect the mechanical, magnetic, or chemical properties of the steel. This report discusses the relationship of alloy steel to plain carbon steel, and describes the alloy properties in terms of the standard classification.

This is one of a new series of *American Machinist* reports written to simplify metallurgy for the non-metallurgist. Earlier reports in the series discussed brass, and plain carbon steel.

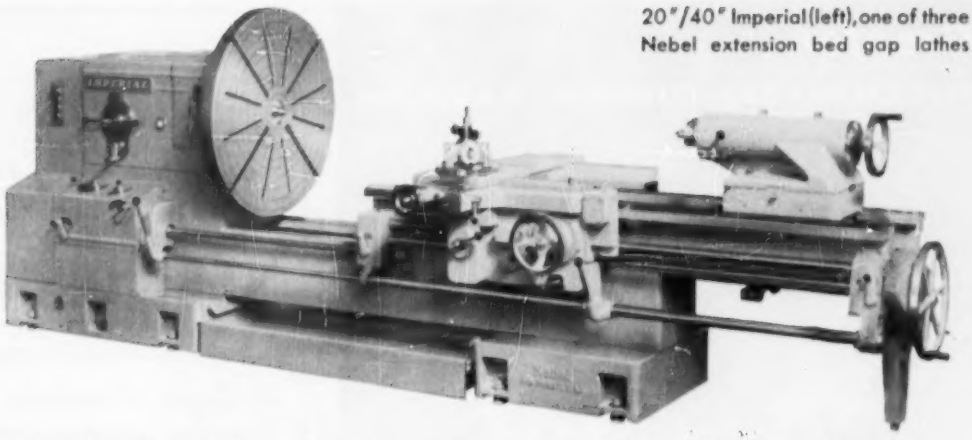
10 pages — 15 cents a copy

READER SERVICE DEPT.

American Machinist

McGraw-Hill Building

New York 36, N. Y.



20″/40″ Imperial (left), one of three Nebel extension bed gap lathes

Nebel *double duty* extension bed gap lathes

You can (1) turn your outsize, odd-shaped parts in the wide, deep gap of Nebel extension bed gap lathes. And (2) with the gap closed, you can do all your engine lathe work, too. Double duty means lower capital investment, more efficient use of floor space. Sizes 20″/40″ and 28″/50″. Nebel removable block gap lathes 16″/27″, 20″/30″, 25″/40″; engine lathes 16″ to 36″. Write for bulletins. Nebel Machine Tool Corp., 3407 Central Parkway, Cincinnati 25, Ohio.

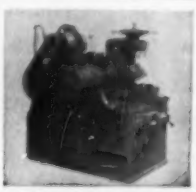
Nebel
LATHES
CINCINNATI

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1 in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.



RUSSELL
HYDR. SAWING MACHINES

All sizes up to 14″ capacity, with and without automatic stock feed

Ask for catalogs

TRIPLEX MACHINE TOOL CORP.
75 West St. New York 6, N. Y.

Model C 50 B

RANDALL and STICKNEY
Dial Gauges and Indicators

are accurate, reliable and built to stand hard usage.

Model "C 50 B" has a 2¼" overall diameter, balanced dial 0-25-0 with .0005" graduations, ½" range and movable dial easily set at zero.

The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units so that repairs can be made easily.

This style instrument can be furnished with various dials, graduations and ranges, in both English and Metric. There is a R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.

FRANK E. RANDALL CO., INC.
248 Ash St.
Waltham 54, Mass., U.S.A.
Makers of Dial Gages Since 1896

NOW AVAILABLE IN DECIMAL SIZES!

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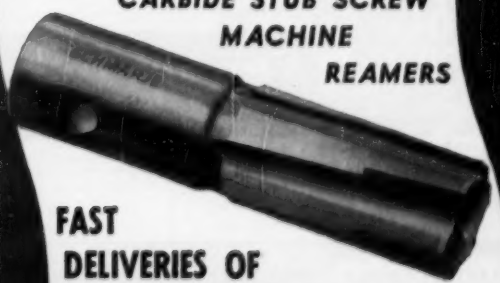
CARBIDE STUB SCREW MACHINE REAMERS



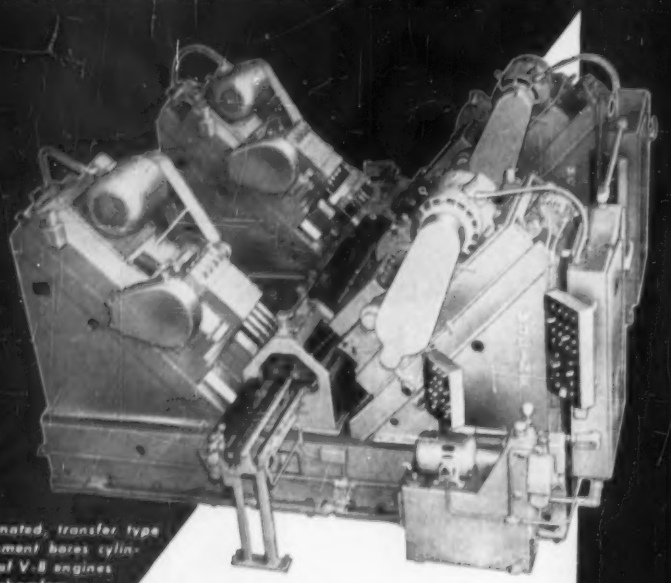
FAST DELIVERIES OF THE EXACT SIZE YOU WANT!

Better finish . . . greater accuracy . . . lower tool cost! *Write today for specifications and prices.*

SCHMARJE TOOL COMPANY
Carbide Reamers • Form Tools
MUSCATINE 2, IOWA

For Greater...

PRODUCTION • EFFICIENCY • SAVINGS



Automated, transfer type equipment bores cylinders of V-8 engines and chamfers both ends of bores.

Use an individually designed "Hole-Hog" Machine Tool for such jobs as:

- **Multi-Spindle Boring**
- **Single and Multi-Spindle Honing**
- **Straight Line Multi-Drilling**
- **Adjustable Spindle Drilling**
- **Vertical and Way-Type Fixed Center Drilling, Boring and Tapping**
- **Special Multiple Operation Machine Tools**

Over 50 years of Machine Tool Engineering experience is at your service. Tell us your particular problem.

Representatives in principal cities.

101

MOLINE TOOL CO. MOLINE, ILLINOIS

MOLINE TOOL COMPANY
100 20TH STREET MOLINE, ILLINOIS

The "MASTER COMPAR"

INDICATING MICROMETER COMPARATOR

has the VISIBLE feel

No Arguments as to correctness of reading due to "feel".

Use it as Comparator, Master Micrometer, Go & No Go Gage.

1" Range reading in 1/10,000"

A RIGHT HAND TOOL

Balance button for movable Anvils on RIGHT Hand side enables you to hold tool the conventional way.

NEW — Resetting to Zero in 5 seconds.

Quick adjustable tolerance bands. Heavy TUNGSTEN CARBIDE Anvils will actually measure Out-of-Roundness, Oroboss and Taper.

0-1" SIZE IN HARDWOOD CASE

$95.00

Also Available in LARGER SIZES

Ask for illustrated Circular — Code GIOFF

Sold thru Tool Supply Houses

Ask for Demonstration

GEORGE SCHERR CO., INC. 200-AM LAFAYETTE STREET • NEW YORK 12, N.Y.

SAVE VALUABLE ALUMINUM!

Cutbacks of aluminum for civilian consumption, and its importance in defense production, increase the necessity of economical and efficient methods for working this widely used non-ferrous metal. The *American Machinist* Special Report, "How to Work Aluminum and its Alloys," explains what you can do to make your supply of aluminum go further.

This valuable 16-page article is a summary of the latest developments in fabricating this vital metal . . . the characteristics of aluminum alloys . . . machining methods . . . sheet-working methods . . . casting and forging . . . joining methods . . . cleaning and finishing. Reprints of this timely article are available at only 25 cents per copy.

Write Reader Service Department:

American Machinist
McGraw-Hill Building
New York 36, N. Y.

EMPLOYMENT OPPORTUNITIES

The Advertisements in this section include all employment opportunities—executive, management, technical, selling, office, skilled, manual, etc.

Positions Vacant | **Civil Service Opportunities** | **Employment Agencies**
Positions Wanted | **Selling Opportunities Wanted** | **Employment Services**
Part Time Work | **Selling Opportunities Offered** | **Labor Bureaus**

RATES

DISPLAYED

The advertising rate is $19.30 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on a column—8 columns—30 inches to a page.

Subject to Agency Commission.

UNDISPLAYED

$1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.

Box Numbers—counts as 1 line.

Positions Wanted Ads are ½ of above rate.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Not subject to Agency Commission.

Send NEW ADS to AMERICAN MACHINIST, 330 W. 42nd St., N. Y. 36, N. Y. for May 7th issue closing April 23rd

Opportunity...

TO WORK WHERE IT'S FUN TO LIVE

Can You Qualify?

- **Electronics Technician or Engineer**
- **Design, Development and Research Engineer (Aircraft—Mechanical—Electrical)**
- **Physicist**
- **Draftsman**
- **Precision Production Machinist**
- **Precision Machine Operator**
- **Experimental Machinist**
- **Aircraft Sheet Metal Worker**

Here is what you should do:

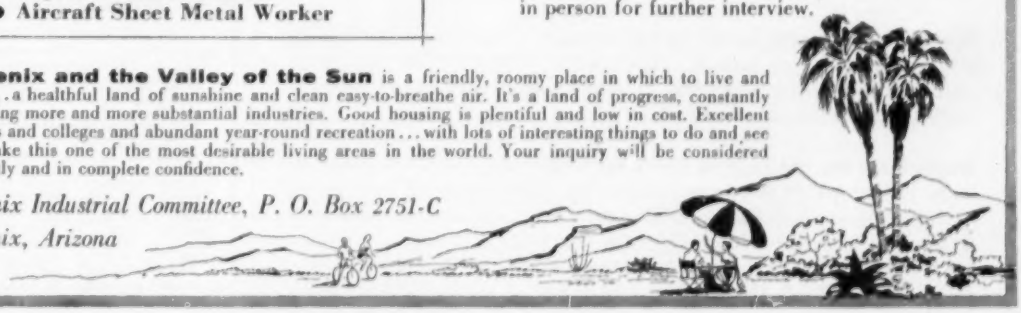
✓ Analyze your own qualifications carefully.

✓ Send a summary of your qualifications and experience. State when you are available.

✓ Do not come to Phoenix without first writing. Job opportunities are mainly restricted to specialists listed here. If your summary qualifies you for consideration you will be contacted by mail, phone or in person for further interview.

Phoenix and the Valley of the Sun is a friendly, roomy place in which to live and work . . . a healthful land of sunshine and clean easy-to-breathe air. It's a land of progress, constantly attracting more and more substantial industries. Good housing is plentiful and low in cost. Excellent schools and colleges and abundant year-round recreation . . . with lots of interesting things to do and see . . . make this one of the most desirable living areas in the world. Your inquiry will be considered promptly and in complete confidence.

Phoenix Industrial Committee, P. O. Box 2751-C
Phoenix, Arizona



NEED PRODUCTION ENGINEERS . . . EXECUTIVES?

A quick solution to this problem can be obtained through an employment advertisement in our EMPLOYMENT OPPORTUNITIES SECTION of regular issues of American Machinist.

American Machinist's readership is confined to just the type of men you need . . . Waste circulation is avoided . . . You reach only the men you want.

AMERICAN MACHINIST
330 W. 42nd St., New York 36, N. Y.

REPLIES (Box No.) Address to office nearest you
NEW YORK: 330 W. 42 St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITION VACANT

Machine Shop Assistant needed by medium sized heavy process machinery manufacturer. Young college engineer graduate with some experience preferred. Position has a future. First duties will cover rate setting, carbide tool development and assist in increasing productivity. Company has liberal profit sharing plan. Salary open. Location S.E. Penna. Reply P-9590, American Machinist.

WANTED
SALES REPRESENTATION

Nationally known gage manufacturer interested in securing exclusive sales representation in Michigan and other important areas.

RW-1358, AMERICAN MACHINIST
330 W. 42nd St., New York 36, N. Y.

Your inquiry will have special value . . .

if you mention this magazine, when writing advertisers. Naturally, the publisher will appreciate it . . . but, more important, it will identify you as one of the men the advertiser wants to reach with this message . . . and help to make possible enlarged future service to you as a reader.

Gaging . . .

the Surplus Machinery Market

"Situation very firm: outlook optimistic" is the consensus of business reports from surplus machinery dealers across the nation. Best indication that business is on a firmer footing than it's been in a long, long time is that orders are spread across the board from every type of metalworking industry, with one or two exceptions.

Today's customers fall into two categories. First there are those whose business is booming, who want to up production and cut costs at the same time. Second, there are the not-so-prosperous firms who are up against outfits with better production setups. These firms can't match competitive prices with outdated production equipment and methods; have to get aboard the replacement bandwagon. Either way, they need machine tools fast.

In spite of today's generally sunny business climate, there are still a few clouds in the sky that might bear watching. For one thing, a big Midwestern dealer admits he's worried about the slump in production of farm machinery. Farm prosperity has long been an economic bellwether — when farm income starts to slip, the whole economy has often followed suit a year or so later. That's true of the auto industry, too. But the auto slump is unusual this time. The public is still buying plenty of cars by normal standards. It's just that the automakers went hog wild productionwise on the '56 models; have to ease up while dealers get rid of huge overstocks.

Toolroom equipment is still in top demand everywhere. Horizontal mills, good modern lathes, radial drills, shapers, and universal mills are still going well, but in many spots there aren't enough toolroom lathes to fill demand.

Duplicators are the rage on the West Coast, most of them going to large shops, which keeps the prices up. This has kept the prices of duplicating attachments for standard machines up, too. Evidently some buyers want duplicators for short-run production because they can be tooled up quickly. Others are adding them to their shops to round out the number and types of machines they have available. Steel companies have been buying large grinders, especially on the East and West Coasts.

Recent trend is to order inspections of surplus machines before buying, at least in West Coast area. Inspection services are available to check machine operation, dismantle and inspect each part, check for wear in critical spots. The customer gets a factual report plus photographs of the machine so he can make sure it's what he wants. Inspection services don't usually say if the machine's worth the asking price. Inspection costs around $40-65 for a day's work, based on time spent in arriving at an analysis.

Machine inspection happens only on customer's demand. Dealers would rather see the buyers on hand, and inspectors don't like working on old machinery. Inspecting for wear is an exacting job, and the inspector has to make sure it's what the buyer wants.

But buyers say they learn more from an inspection than if they look the machine over themselves. Inspections are especially useful for overseas, buyers, who order most of the inspection now being done.

SEARCHLIGHT SECTION
(Classified Advertising)
BUSINESS OPPORTUNITIES
EQUIPMENT - USED or RESALE

DISPLAYED RATE
The advertising rate is $14.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

UNDISPLAYED RATE
(Not available for equipment advertising)
$1.50 a line, minimum 3 lines.
Box Numbers—Count as one line.
Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Send new advertisements to
AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.
for May 7th issue closing April 23rd.

PRACTICALLY NEW
DOUBLE CRANK PRESSES

Bliss No. 9-168W, cap. 400 tons, Bed 108"x60".
Bliss No. 8-120, cap. 250 tons, Bed 120"x50".
Minster No. 50-7-62, cap. 200 tons, Bed 72"x50".
Bliss No. 6-84W, cap. 140 tons, Bed 84"x36".
Bliss Toledo No. 93½-J, cap. 140 tons, Bed 108"x 48".

All Machines have Air Clutch and some have Air Cushions and Motor Driven Ram Adjustment. Still set up in Plant

"If it's machinery; we have it."

NATIONAL MACHINERY EXCHANGE
138 Mott St., N. Y. CAnal 6-2470

BENNETT MACHINERY CO.
GUARANTEED MACHINE TOOLS

BORING MILLS 4½" bar Sellers, Floor Type
3½" bar Gilbert, Floor, 1943
4" & 3½" Bar Landis, Floor Type (2)
3" Bar Universal Thlo. Type, Triway
GRINDERS. 12"x48" & 16"x96" Landis, Late (2)
60" Hanchett Vert. Spin., No. 00 Hyd., Surf.
Nos. 2B Reid, 3B Abrasive, Surf.
36"x42" Pratt & Whitney Die & Surf.
16"x96" Cincl. Plain Cyl.
LATHES. 25"x192" Con. L. & S., T.A., Late
14"-16½"x78" Con. Monarch, T.A.
20"x54" con. Reed Prentice '43
TURRET, No. 2H10 Libby 18½", '43
MILLER, 2686 Van Norman, '42
SHAPER—32" Cincl., '41; 24" Cincl. Univ., '40
SHAPER, VERT., 12" Pratt & Whitney, 1942
SLOTTER, 36" Rockford, Hyd., '44

375 Allwood Rd., Clifton, New Jersey
Phone PRescott 9-8996 N. Y. Phone: LOngacre 3-1222

Indianapolis
MACHINERY & SUPPLY CO.
1983 South Meridian Street
Indianapolis 6, Indiana

- SBD 72-30 American Duplex Vertical Broach 30-ton 72" stroke, 1943
- 36" x 240" Centers Niles Timesaver Engine Lathe. New in 1941.

Write for Complete Stock List

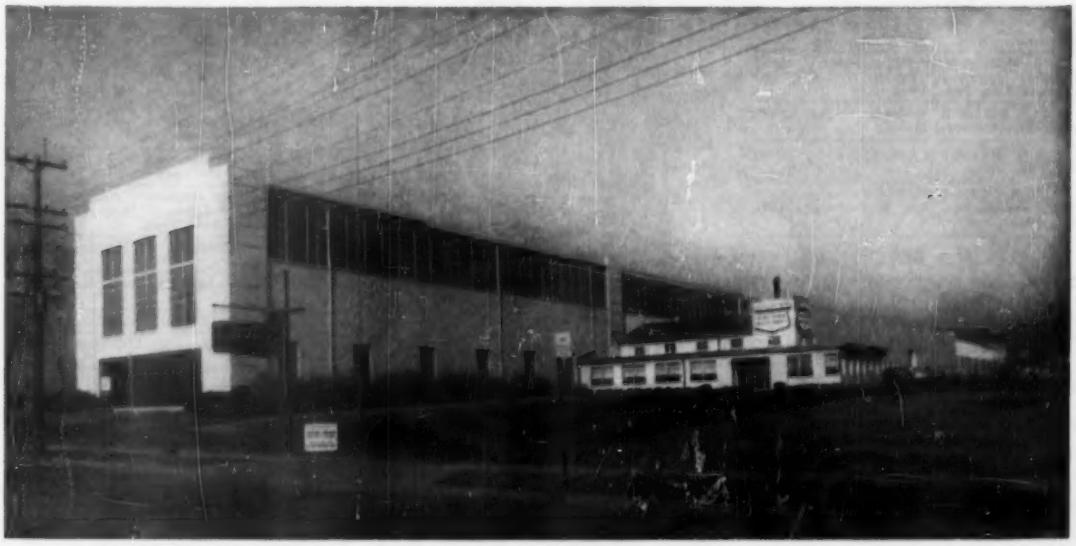
LATE TYPE MACHINE TOOLS

10—Fellows Straight Line Gear Generators with rack type cutter. Serials 17960 to 22694. Attractive price for the lot.

D. E. DONY MACHINERY CO.
4357 St. Paul Blvd., Rochester 17, N. Y.

Eastern Rebuilt Machine Tools

THE SIGN OF QUALITY — THE MARK OF DEPENDABILITY



HONING MACHINES

No. 182 Barnesdrill Hone, m.d.
No. 854 Micromatic Vertical Honing Machine, m.d.
H1 Micromatic Horizontal Hydrohoner, m.d.
H4 Micromatic Horizontal Hydrohoner, m.d.
No. 6 Barnes Twin Spindle
No. 306H Barnes Single Spindle
No. 224B Barnes Honing Machine, m.d.

THREAD GRINDERS

No. 33 Excello, m.d.

INTERNAL GRINDERS

No. 5 Bryant, m.d., latest
Model 5Y Bryant, m.d.
No. 16—16" Bryant, m.d., hydraulic Hole Grinder
No. 16CR16 Bryant, m.d., latest
No. 16—22" Bryant, m.d., latest
No. 16—36" Bryant, m.d., latest
No. 18-A-28" Bryant, m.d.
No. 24-36 Bryant Hole & Face Type, m.d., late
No. 24P—26" Bryant, m.d.
No. 24—21" Bryant, m.d.
No. 24-L-36 Bryant, m.d., late
No. 24-LW-36 Bryant, m.d., late
No. 44 Heald Facing Type Borematic, m.d.
No. 47A Heald Borematic, m.d.
No. 649—10" Van Norman Automatic Oscillating Radius, m.d., latest
No. 70A Heald, m.d., latest
No. 72 Heald Sizematic, m.d.
No. 72A Heald Sizematic, "Duplex", m.d.
No. 72A Heald Gagematic, m.d.
No. 72AS Heald Gagematic, m.d.
No. 72AS Heald Sizematic, m.d.
No. 72AS Heald Sizematic, m.d.
No. 72AS Heald Plain, m.d.
No. 73 Heald Airplane, m.d., latest, new
No. 74 Heald, m.d.
No. 74 Heald, Plain Long Base, m.d., 1941
No. 75A Heald, m.d., latest
No. 78 Heald Centerless Cylinder Grinder, m.d.
No. 81 Heald Gagematic, Sizematic, m.d.
No. 81 Heald Plain & Sizematic, m.d.

PUNCHES & SHEARS

No. 2 Hilles & Jones Horizontal Punch, m.d.
No. 7 Thomas Vertical, latest
No. 6½ Hilles & Jones Punch & Shear, single end, type G
Cleveland Shear, 72" gap, 18" blade, 1" plate
Cleveland Type G Vertical Punch, 72" throat, m.d.
Wiedemann R7 Turret Punch

SURFACE GRINDERS

No. 2B Brown & Sharpe, m.d.
No. 33 Abrasive, m.d.
14" Pratt & Whitney Vertical, m.d.
No. A-1-8" Arter Surface Grinder
No. 22—12" Heald Rotary, m.d.
#25A—24" Heald Rotary, m.d.
No. 2 Brown & Sharpe, m.d.
Model 84 Bridgeport Face Grinder
#300-60 Hanchett Vertical Spindle Surface Grinder
Model 4-C Thompson Hydraulic Surface Grinder, m.d.

DISC GRINDERS

No. 230 Gardner Double End, belted m.d.
No. 151 Besly, m.d.
Hammond Disc Grinder, Model No. 600
Model V10 Hammond Belt Sander, m.d.
No. 4 Gardner Disc Grinder, m.d.
7½ H.P. U.S. Elec. Tool Co. Disc Grinder, m.d., new
14A Gardner Grinder, m.d.
No. 186—30" cap. Gardner, m.d., latest type
No. 121 Hanchett Prod. Face Grinder, m.d.
No. 228 Hanchett Opposed Disc Grinder, m.d.

PLAIN CYLINDRICAL GRINDERS

No. 5 Brown & Sharpe Plain Cylindrical, m.d., 1942
6x15" Cincinnati Plain Hydraulic, m.d.
6x18" Cincinnati Model EA, m.d.
6x18" Cincinnati Model ER, Plain Hydraulic, m.d., Filmatic Spindle
6x18" Landis Type C Hydraulic, m.d., late
10x18" Cincinnati Plain Hydraulic, Model ER, m.d., Filmatic Spindle, 1945
10x18" Cincinnati Model EA, m.d.
10x18" Norton Type C, m.d., latest
10x36" Cincinnati Hydraulic, m.d.
10x36" Norton Type C, m.d.
10x72" Landis, m.d.
10x72" Norton, motorized
12x36" Landis Plain Self-Contained, m.d.
12x96" Landis Plain Self-Contained, m.d.
14x36" Landis Plain Hydraulic, m.d.
14x52" Norton, motorized
16x72" Landis Plain, m.d.
16"x72" centers Type C Norton Semi-Auto., Hydraulic
16"x96" Cincinnati Plain Cylindrical, m.d.
16" raised to 20" size x 72" centers Norton, Type C, m.d.
16x72" Norton Type C, mechanical, m.d.
20x120" Landis Plain Self-Contained, m.d.

UNIVERSAL GRINDERS

10x24" Landis Type C, m.d.
12x48" Norton Universal, m.d., latest
14x48" Landis Universal
14x72" Cincinnati Model ER, m.d., latest type Filmatic Spindle
18x60" Landis Universal, m.d., Type C

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FALK MACHINERY COMPANY

10 WARD ST. ROCHESTER 5 N. Y.

Every Item Guaranteed as Represented

LATHES

4 DE POTTER & JOHNSON Automatic Turret Lathe, Late Type.

27"x18' MONARCH "N" Geared Head Lathe, 11' centers, Taper Attach., Full Equipment, Late Type, 1942.

24", 34" BULLARD Vertical Turret Lathe, Turret Rd. Side Hd., M.D.

No. 2, 4, 6 WARNER & SWASEY Univ. Turret Lathes, Bar Feed.

No. 2, 7 BARDONS & OLIVER Universal Turret Lathes, Preselector, Bar & Chucking. Late Type.

DRILLING MACHINES

6 Spindle No. 2 LMS LELAND-GIFFORD Drill Press. Late Type.

No. 2 M. T. Six Spindle ALLEN Type KH Drill Press, Individual Motor Drive, Late Type.

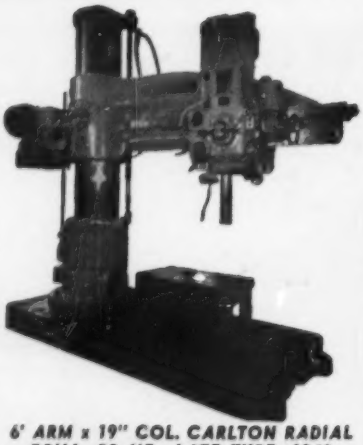
No. 18 MARVEL Hydraulic Roll Stroke Power Hack Saw, 18" x 18" cap., M.D.

No. 2 BROWN & SHARPE Vert. Mill, Light Type, Swivel Head, M.D., Late.

No. 2B BROWN & SHARPE Horizontal Mill. Motor in Base. Late Type.

1A PRATT & WHITNEY Jig Borer, with Gauges, rods, Collets and Chuck.

4' x 11" CARLTON Radial Drill. Motor on arm. Late Type.



6' ARM x 19" COL. CARLTON RADIAL DRILL, 20 HP., LATE TYPE, 1943

No. 91-C TOLEDO Straight Side Double Crank Power Press, 27"x36" Bed Area, 60 tons cap., M.D.

No. 8 BLISS CONSOLIDATED 90 tons cap. O.B.I. Geared, Air Cushion. M.D.

400 tons CHAMBERSBURG Hydraulic Wheel Press, 14" Ram, 96" between Tie Bars, 12' to End Support. M.D.

No. 1, 2 BUFFALO FORGE Vertical Angle Bending Rolls, M.D.

42 tons C-14 FERRACUTE O.B.I. Press 4½" stroke. New 1946.

½, 1½ BUFFALO FORGE Universal Ironworker, Notcher and Coper, M.D.

No. 8LS FELLOWS M.D. Gear Lapping Machine. Detachable Head, Univ. Work Support.

No. 00G BROWN & SHARPE High Speed Automatic Screw Machine. M.D. Late type.

10' x ¼" WYSONG & MILES Power Squaring Shears, Motor Driven.

GRINDERS

No. 13 BROWN & SHARPE Universal Tool & Cutter Grinder. Complete Equipment. Late type.

4"x12" LANDIS Hydraulic Plain Cylindrical Grinder, M.D., Late Type

6"x18" NORTON Hydraulic Horizontal Surface Grinder, Permanent Magnetic Chuck, Coolant System, Late Type.

No. 14 WD HAMMOND Double End Carbide Grinder, M.D.

6" x 10" x 48" NORTON Hyd. Horiz. Surf. Grinder, M.D.

4T SELLERS TOOL GRINDER, M.D., Late Type.

30" INGERSOLL Face Mill Cutter Grinder, M.D. Late Type.

6" x 18" LANDIS Type "C" M.D. Hyd. Cylindrical Grinder, Serial #29196.

No. 20B BESLEY Motor Driven Disc Grinder. 26" wheels, Late Type.

No. 194 BARNES Vertical Hone, 4" capacity, 12" stroke, Motor Driven.

15'x10'x36' BETTS double housing Planer, 4 swivel heads tandast control box table Motor Driven.

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42" Swing x 72" Centers. NORTON TYPE C CYLINDRICAL GRINDER, 16" Extra Heavy Frame, 20 HP wheel motor, power rapid traverse, also extra equipment Ser. C-22459, New in 1947. Replacement cost $40,000. OUR PRICE $17,500.

PARTIAL LISTING

BORING MACHINES

Foote-Burt Vert, 26" sw, new 1941
#49 Heald Borematic, new 1944

DRILLS

1 spdl, 14" sw, #2 Avey, new 1945
1 spdl, 26" sw, #2LMS L.-G., R.G., 1945
1 spdl, 24" sw, #2MA6 Avey, new 1942
1 spdl, 26" sw, #4MS L.-G. hydraulic
2 spdl, 24" sw, #3 Avey, AC MD
3 spdl, 26" sw, #2LMS L.-G, 1942
3 spdl, 26" sw, #3MS L.-G, new 1943
3 spdl, 24" sw, #2MS Allen, 1942
4 spdl, 16" sw, #2LMS L.-G, new 1942
4 spdl, 26" sw, #2LMS L.-G, new 1944
6 spdl, 26" sw, #2LMS L.-G, new 1942
6 spdl, 26" sw, #2LMS L.-G, new 1943
#314-A Baker Univ H.D., 1943
16 spdl, Fox #K60H, #2 taper, 1944

BORING MACHINES

100" N-B-F, 2 swivel hds, DC MD
Foote-Burt Vert, 26" sw, new 1941
36" Bullard VTL, side hd, 1941
#49 Heald Borematic, new 1944

GRINDERS

3"x12" #5 B&S, Rap. Trav., 1942
4"x12" #4H Landis, Auto Cycle, 1942
6"x18" Norton Type C, new 1942
10"x18" Norton Type C, new 1942
10"x36" Norton Type C, new 1943
10"x48" Norton Type C, new 1943
10"x72" Hill-Clarke, AC Mot. Dr.
10"x96" Hill-Clarke, AC Mot. Dr.
10"-36"x36" Norton, angular wheel
14"x48" Landis Type C, new 1941
16"x12" Hill-Clarke, AC Mot. Dr.
16"-36"x72" Norton, AC MD, 1941
42"x72" Norton, extras, new 1947
18"x96" Hill-Clarke, AC Mot. Dr.
16"x120" Norton Plain Cyl.
20"x192" Norton, AC Mot. Dr.
14"x84" Van Norman C.B., 1951
24"x264" Norton, AC MD, Rebuilt
26"-32" Gap x 114" Norton Pl. Cyl.
14"x48" Landis Type C Univ. chuck
#5A Bryant Internal, new 1943
#16A-16 Bryant Internal, new 1943
#16-36 Bryant Internal, new 1941
#24-36 Bryant Internal, new 1941
#24-96 Bryant Internal, new 1941
#72A5 Heald Internal, new 1942
#72A5 Heald Bridge Type Int.
#314 Besly Double End Disc, 1946

LATHES

16ML-16"x96" LeBlond Auto.
#16ML-16 LeBlond, Semi-Auto. 36" cc
14"x36" Amer. Grd. Hd., MD
27"x84" Amer. Grd. Hd., MD
36"x120" Putnam Grd. Hd., MD
R14 Seneca Falls, 16"x30", 1943
120"x96" or N-B-F, sw. 2320
#9W Cinn Acme Univ. Turret
No. 4 Gisholt Univ. Tur., A.C. & B.F., 1941
#3AL Gisholt, cross-slide Tur. 1941
#3H-16 Libby H.D. Tur. 1943
#4A W&S Turret, new 1944
#7U Fastermatic, tur, 32"-sw, 1944
#6D Potter & Johnston, new 1941

MILLERS

54"x30"x16 Ingersoll Slab, 1934
54"x8" Ingersoll Openside, 1942
54" Ingersoll Vertical
10"x60" P&W Mod. B Thread Mill
#CT L-B Thread Mill, new 1943
No. 2 Cinn. Univ. Hi-Power
#08 Cinn. Vert. back lash, 1942
#36 Van Norman, Rebuilt, 1941
#1-16 Van Norman Prod. 1942

PLANERS

36"x36"x12' Rockford Openside '42
60"x48"x27' American, 4 hds.
60"x48"x30' Hamilton, 4 heads

MISCELLANEOUS

#3L La Pointe 12T Hwiz. Broach
6" Goss & DeLeeuw, 8 spdls, 1941
#306 Barnes Vert Hone, new 1942
15 Ton Hyd. American Press, 1946
#11RD 2 Hd, W&S Tapper, latest
#12HB G&E, 12" cap. Gr. Hobber
#36DM G&E 2 Spdl. Bevel Gr.
#61A Follows Gr Shaper, 16" cap.
#5A Kaufman Prod. Tapper, 1947
#HRB Barber-Colman Sharp. Mach.
16 ga. 42" Economy Power Shear
6"x6" Peerless H.D. Hacksaw, 1942
15 T Toledo Overhead Crane, 39½

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THOMPSON TRUFORM CRUSH GRINDER

Model "B". Working capacity 18" x 12" x 36". fully equipped, complete with wheel crushing fixture, permanent magnetic chuck 12" x 36", coolant pump reservoir and filter. Machine like new.

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1 Reishauer Gear Grinding Machine. Must be in excellent working order. Advise serial number, age and price. We are user.

W1135 AMERICAN MACHINIST

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EQUIPMENT WANTED

1 FELLOWS "100" or 120" CUTTING MACHINE.
For inside and outside cutting.

W-1120, AMERICAN MACHINIST
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New or used, 54" x 100" minimum platen area; 1, 2 or 3 opening; 10 psi minimum pressure; 250°F maximum operating temperature; upward acting platen desired. In reply, please give all details regarding operation, construction, price, location and availability.

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- 10" Horiz. Boring Mill (Used one year)
- 8" x 18" Cinc. Tool & Die Mill w/ depth control, 1952
- DoAll Mod. 36 Hydro-feed Contour Saw
- 29" Monarch Mod. N Lathe. Factory-raised in sand to swing 36½"-48" cc w/ air tracer, 1950.
- NEW PFEIFER Horiz. Boring Mills & Toolroom Lathes (Acclaimed the world's most accurate) —Write for Firm Proposal.

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Niagara 5' Power Shear 16-Ga. M.D.
Brown & Sharpe No. 2 Surf. Grinder All Motorized
G&L 3" Bar Table Type Horiz. Boring Mill
Colburn 2-Spindle Box Col. Heavy Drill M.D. 29".
Niles (Timesaver Model) 32"x14' Bed Grd Hd M.D. Lathe 7' Centers.
Lambert 4" Bar Table Type Horiz. Boring Mill.
Ohio 24" M.D. All Grd. Feeds Shaper 1942 model
Cincinnati No. 5 Rect. Overarm Grd. Hd. Plain Horiz. Miller.
Bausch 44" Vert. Boring Mill 2 heads.
Knight #40 Vert. Jig Borer.
American 20"x8' Grd. Hd. Lathe motor in base.
Landis 20"x72" and 16"x96" Plain Ext. Grinder
Hanchett 25 H.P. Sp. Vert. Hydr. Surf. Grinder 12"x48" table
W & S No. 2-A Grd. Hd. Univ. Turret Lathe chucking
Rivett No. 104 A.C. M.D. Internal Grinder.
Milwaukee Nos. 2-B & 3-B Horiz. Plain Millers D.O.
Cincinnati 30"x36"x10' D.H. Planer 2 Hds. Box Table
Heald No. 72A-3 Hydr. Int. Grinder Rod Head Sp
American 26"x27' Bed Grd. Hd., Lathe
Cleveland 30"x8' Table Open Side Planer 2 Hds.
Cincinnati No. 2 Hi-Power S.P.D. Vert. Miller.
B&S #2A Grd. Hd. Horiz. Univ. Miller
Barnes 28" All Grd. Camel Back Drill 1-Sp.
Blanchard M.D. Vert. Sp. Surf. Grinder 26" chuck.
Sundstrand 4-Sp. Vert. Rigidmill.
Heald #22 Rot. Surf. Grinder 12" chuck 1942.
Landis 2-Sp. 2" Cap. Bolt Threader M.D.
Hendey 16"x8' bed G.C.G. Lathe 1939.
G & E 24" Gear Box Shaper Tilt. Table Top.
Newton 48" Table 1-Sp. Cent. Vert. Miller.
Foster 2-F Fastermatic Hyd. Turret Lathe.
Kempsmith No. 2 Vertical Maximiller M.D.
P & J #2 Auto. Prod. Miller, 2 Tables.
Cincinnati #2, #3 & #4 Centerless Grinders, all Motor Driven
Bullard 24" Vert. Turret Lathe
Lynd-Farquhar 28" stroke open side Shaper Planer.

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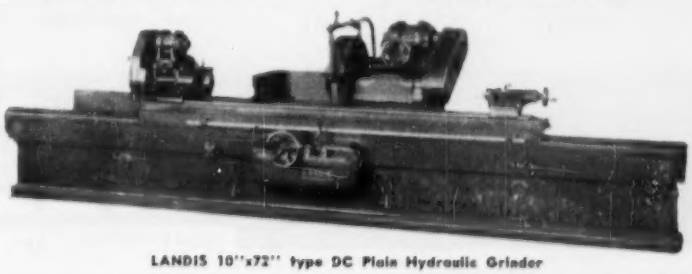
BROACHES
CINCINNATI 1-30 Duplex Vertical, cap. 2,000 lbs. 30" stroke, Hydraulic; late
COLONIAL VGI-10-48 Vertical, cap. 20,000 lbs.; 48" stroke, Hydraulic; late
LaPOINTE 10-54" Vertical, Model SRV, cap. 20,000 lbs.; 54" stroke; new 1947
LaPOINTE 15-66" Vertical; model SRV; cap. 30,000#; 66" stroke; New 1947
OILGEAR 3XA Horizontal, cap. 20,000 lbs.; 56" stroke; Hydraulic; MD
OILGEAR XL-6 Horizontal; cap. 3-tons; 36" stroke; late type

DRILLS — Manufacturing
ALLEN No. 5, 4-spindle, No. 4 M.T.; late
AVEY No. 2, 2-spindle Drill Press; late type
BARNES N-2 Hydram; 2" cap., 22 swing; No. 5 M.T.; Hydraulic; M.D., late type
BARNES model H-3; 3" cap., 24" swing, #5 M.T. Hydram; late type
BARNES No. 2011/4, 4-spindle; No. 4 M.T., 20" swing; M.D., late type
BARNES No. 262, Heavy Camel Back; late
LELAND-GIFFORD No. 2LMS, 26" single spindle; late type
LELAND-GIFFORD No. 1LMS, 4-spindle; M.D.; late type
LELAND & GIFFORD #1LMS 2 spindle; M.D.; late type
LELAND-GIFFORD Model 2 LMS 4-spindle Pedestal Drill; late type
LELAND-GIFFORD model 2LMS, 2-spindle

SHAPERS and SLOTTERS
CINCINNATI 24" Horiz. P.R.T.; late type
GOULD & EBERHARDT 32"; motor drive
HENDEY 12" Universal High Speed"; late
MOREY 8" Vertical Shaper; late type
NEWTON 15" Vertical Slotter; M.D.
PRATT & WHITNEY 6" Vertical; Model B; late type
PRATT & WHITNEY 10" Vertical; M.D.

LATHES — Engine and Mfg.
AMERICAN 36"x204" centers "Super-Productive"; Timken; M.D.; late
GISHOLT No. 12 Hydraulic Automatic; late
HENDEY 16-24"x30" centers; Timken; late
HENDEY 24"x36" centers, M.D.; late type
JONES & LAMSON "Fay" 20"x25' Auto.
LeBLOND 16"x36" centers Auto.; Timken
LeBLOND Model 7ACL Crankshaft; 9"x30"
LeBLOND 20"x48" centers, H.D. Timken; late
LeBLOND 25"x54" Mfg.; latest
LeBLOND 27"x144" centers; motor drive
LODGE & SHIPLEY No. 5, 24" & 90" centers; DUOMATIC; Timken; late
LODGE & SHIPLEY 12"x30" G.H. Toolroom
LODGE & SHIPLEY 14"x30" Centers; late
LODGE & SHIPLEY 16/22"x54" Toolroom; Timken; late
LODGE & SHIPLEY 18"x54" Timken; latest
LODGE & SHIPLEY 20"x90" Gap; Timken; latest
LODGE & SHIPLEY 22"x80"; Timken



LANDIS 10"x72" type DC Plain Hydraulic Grinder

DRILLS — Radial
AMERICAN 7' arm triple purpose; M.D.
CARLTON 6' arm 19" column; late type
CINCINNATI BICKFORD 6' arm 19" col., Univ.
CINCINNATI BICKFORD 4' arm 11" col. Plain; oil groove
MORRIS 5' arm, 11" column; late type

GRINDERS — Internal
BRYANT No. 5 Internal; hydraulic; late
BRYANT No. 16-C-16 Internal; hydr. late
BRYANT No. 16-CP-16 Internal; late type
BRYANT No. 16-36 Internal; hydraulic gap bed; late type
BRYANT model 24-L-26; latest type
BRYANT model 112Y Hydr. Feed Grinder; late type
CHURCHILL No. 3 Internal; 8" stroke
HEALD No. 72A3 Plain Internal; late
HEALD No. 72A3 "Gagematic" Internal
HEALD No. 78 Centerless; motor drive
HEALD No. 81 pl. chuck type; late type
HEALD No. 81 "Sizematic"; late type

GRINDERS — Surface
ABRASIVE 1½ hand surface grinder; late
ABA 8"x24" Prec. Hydr. Grinder; late type
BILLITER & KLUNZ 48"x186" Way Grinder
BLANCHARD No. 11 Surface Grinder; late type
BROWN & SHARPE #2; motor drive; late
HEALD #22 Rotary; 12" chuck; M.D.
HEALD No. 25A Rotary; 30" chuck; late
HEALD No. 26I Rotary Surface Grinder; 12" chuck, latest type
NORTON 6"x18" Vertical; late type
PRATT & WHITNEY "B" 14"x36" Vert., latest
REID #48 hand feed; 4"x18" late type

SCREW MACHINES — AUTOMATIC
ACME-GRIDLEY 2" RB 6-spindle Automatic Screw Machine; New 1953
BROWN & SHARPE model 00G; late
CLEVELAND 1-1/16" model A single spindle; late
CLEVELAND 2¼" model A single spindle; late
CLEVELAND 6¼" Model A Single Spindle; late
CONOMATIC 1⅞", 6-spindle; late type
CONOMATIC 4½", 4-spindle; late type
GREENLEE 1¾" 6-spindle; late type
GYROMATIC Model 40, 1" 6-spindle; late
NEW BRITAIN #06 Automatic Chucking Machine; late type

CASH • CREDIT • RENTAL • TRADE-IN

LODGE & SHIPLEY 22"x72"; Timken
LODGE & SHIPLEY 22"x96"; Timken
LODGE & SHIPLEY 24"x54"; Timken; latest
LoSWING 4"x60" centers, late type
LoSWING 4"x84" centers, late type
LoSWING 8"x160" centers, late type
MONARCH 14"x54" centers; Model AA
MONARCH 18"x48" Model CBB; late type
MONARCH 18"x48" "CBB" (raises to 26¼"); Timken; late
MONARCH 18"x72" "CBB" (raises to 26¼"); "KELLER"; late
MONARCH 22"x336" c.c. Model M; late
MONARCH 25"x48" model "N", air tracer; late
MONARCH 36"x84" Taper Attachment; late
NEW HAVEN 42"x120" centers geared
NILES 36"x25" bed, Single End Boring, "Time Saver"; late type
NILES 36"x25" bed, Single End Boring, "Time Saver"; late type
NILES 42"x216" centers Geared Head; late type
PORTER-McLEOD 16"x6' Lathe; New
PRATT & WHITNEY 16"x40" c.c.; Timken
SOUTH BEND 16"x10' bed; late
SPRINGFIELD 14"x43" geared; M.D.; late

MILLING MACHINES — Thread
HANSON & WHITNEY 8"x16"; late type
LEES BRADNER No. HT 12"x24" c.c.; late
LEES BRADNER No. LT 6"x72" c.c. late type
LEES BRADNER model 40A Internal; late
MOREY 12"x30" centers; late type
MOREY 12"x120" centers; late type
PRATT & WHITNEY 4½"x12" model C; late type
WALTHAM Thread Miller; 9" swing over carriage; late

PLANERS
GRAY 48"x48"x10' "Maximum Service"; 4 heads; Power Rapid Traverse; D.C. Reversing; M.D.
LIBERTY 144"x7'x48" adj. openside; Box table; 4 hds.; vari-voltage; Power Rapid Traverse; M.D.; late type; NEW 1940
NILES 48"x48"x10' double, 4 hds., PRT; M.D.
NILES BEMENT POND 72"x7'x30"; 4 hds.; Power Rapid Traverse; D.C. M.D.
NILES BEMENT POND 60"x60"x16' double housing; late type
SOUTHWARK No. 1; 16' Plate Edge Planer

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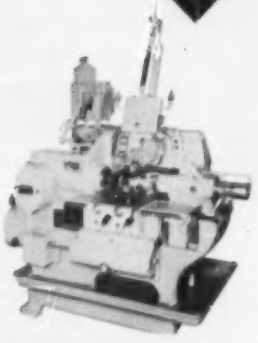
- 1⅝" 6 Spdl. No. 61 New Britain automatic chucker, serial 25230
- 14" x 48" No. 5 Abrasive Surface Grinder.
- No. 1-H-18 Kearney & Trecker simplex mill, late
- 2000 Ton No. 6 National Maxipress, all steel frame.
- 7" No. 76H Baird Chucker, new 1943.
- Engravers, Models BL 2416 & B13616 (7)
- Pratt & Whitney Kellering machines
- No. 20-60 Oilgear dual ram surface broach, 1940.
- No. 56 Sundstrand centering machine.
- 24" No. 314 Baker Brother H. D. Drill.
- 16 Spdl No. D20H Natco multiple drill, 1943.
- 36" No. 36H Gould & Eberhardt gear hobber.
- No. 3 Cincinnati filmatic bearing centerless grinder.
- 4" x 12" No. 4H Landis plain hyd. cylindrical grinder, 1943.
- 6" x 30" Cincinnati plain hyd. cylindrical grinder, 1942.
- 13" x 60" Hanchett vert. spdl. surface grinder, late.
- 6" x 18' Horton horiz. spdl. surface grinder.
- 14" x 46" Handey toolroom lathe, new 1940.
- 24" x 8' Bed LeBlond H. D. Engine lathe.
- 36" x 156" cc. Monarch "NN" engine lathe, 1942.
- 126" x 96 ft. cc. Niles Bement Pond engine lathe.
- Model 10 Sundstrand automatic lathe, late.
- 15" x 30" Lipe Carbo-Matic production lathe, 1942.
- 36" Rockford hydraulic openside shaper-planer.
- 36" Rockford hydraulic vertical slotter, new 1944.



Model 10 Sundstrand Automatic Lathe with Timken Bearing spindle Cycle type machine with hardened ways. Rebuilt and guaranteed new condition, immediate delivery.

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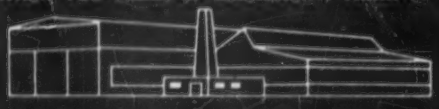

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Serving the World's Largest Manufacturers

#45—9" Giddings & Lewis Horizontal Table Type Boring Mill Serial #15151

42" Bullard Vertical Serial #8706

(2) 13" Peerless Power Hack Saws

#72A3 Heald Sizematic Internal Grinder Serial #12278

30" x 10' Hanchett Plano Surface Grinder. Excellent.

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12"/25½"x10' Centers H. D. Toolmakers Lathe. New 1943. Forced & automatically lubricated. 24 Spin. speeds, Taper, 2 Chucks, Chippan, Face Plates etc. Excellent condition.

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10 to 12 foot lengths
Any diameter up to 1¼ inch
All thread forms
All metals

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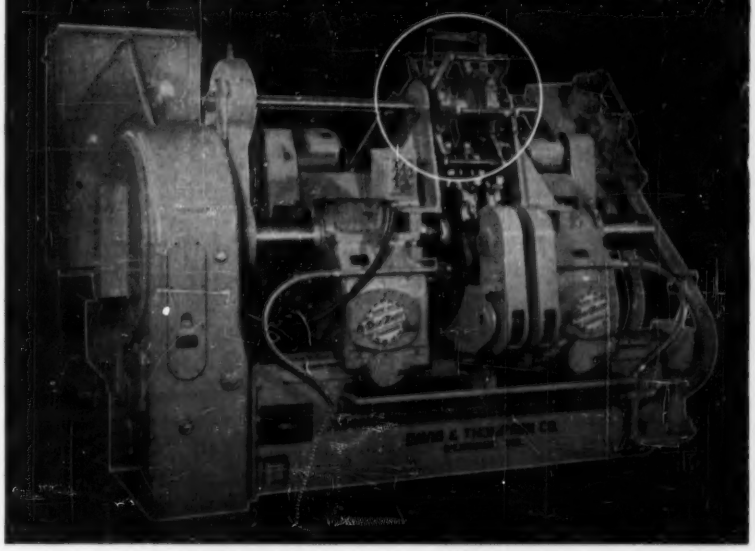
...Milling and Centering Steering Gear Shafts at the Rate of 360 Per Hour



This continuous type milling and centering machine has been furnished with an automatic unloader (indicated by circle) which transfers finished parts onto a conveyor or discharge chute. Milling and centering of both ends is done simultaneously and in continuous production.

Basically, this is a standard ROTO-MATIC machine tooled-up to handle special production requirements. Rough and finish milling and centering spindles in both heads have micrometer endwise adjustment. Heads are adjustable on the ways. With equalizing jaws in fixtures plus chain clamping, machine is fully automatic.

If you have work of this nature, consult D&T engineering for further details.

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From the *American Machinist* Library of *Tips for Top Shop Men*

SOME wag said long ago that it isn't smart to step on other men's hands as you go up the ladder—you may need their help coming down. It's just as true that the man who makes his way up by slipping a knife in the back of the man above, spends his time up there ineffectually because he's always got one eye cocked over his shoulder, watching for the knife.

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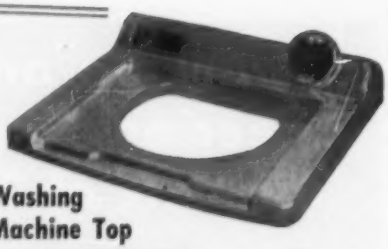

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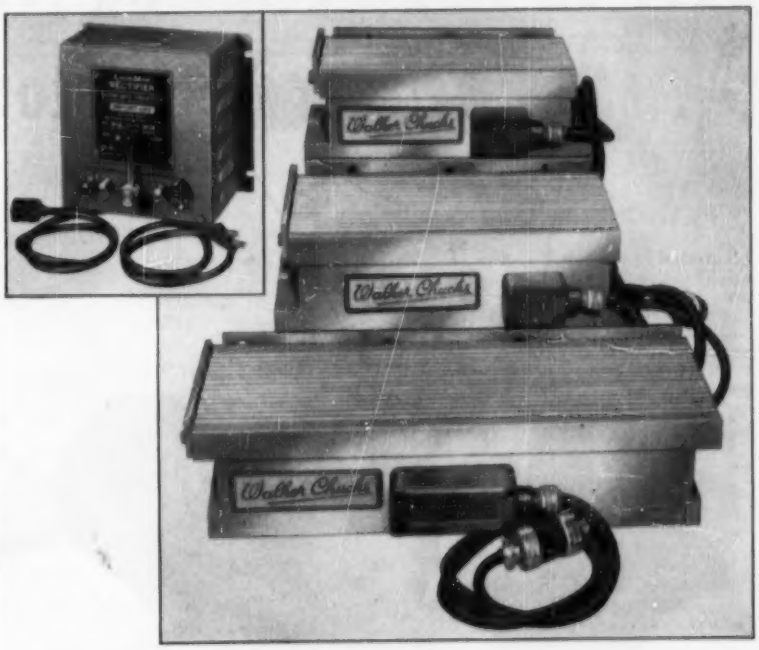
Walker Chucks

You May As Well Have the Best



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SPECIFICATIONS

Table Movement: 6" x 10" — Table Size: 7" x 17½"

Complete details sent promptly on request

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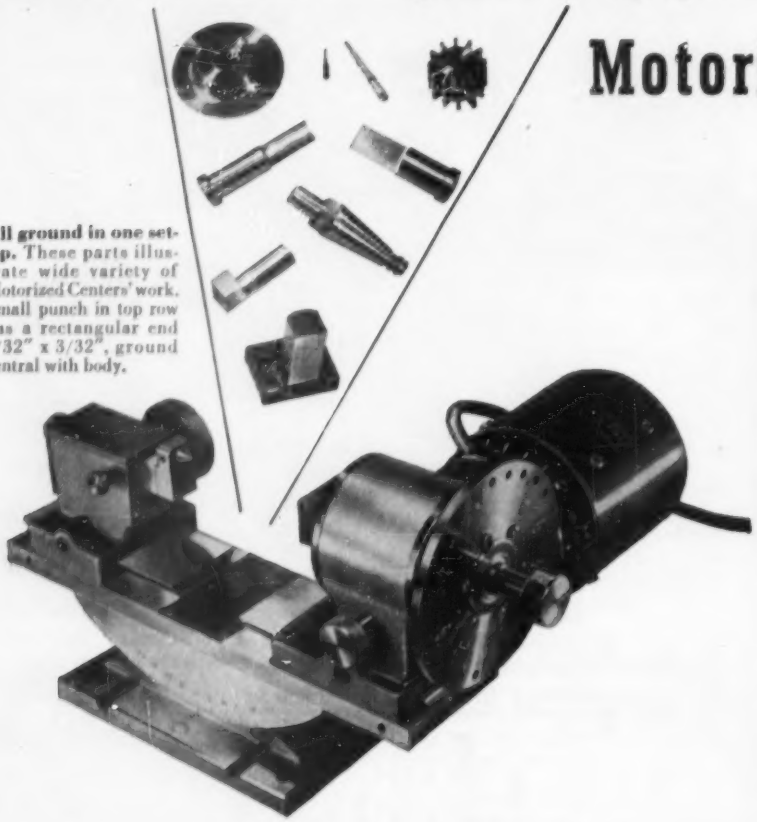


All ground in one set-up. These parts illustrate wide variety of Motorized Centers' work. Small punch in top row has a rectangular end 1/32" x 3/32", ground central with body.

New toolroom attachment for surface grinders, jig borers, drill presses, millers, etc., handles flat, curved or circular work in one setting.

You'll wonder how you ever got along without this portable, precision-built grinding accessory. No longer is it necessary to tie up large, expensive machines to grind square and round punches...do taper grinding, index grinding and face-plate work.

Motorized Centers can be set on a surface grinder chuck in a jiffy and the job completed quicker than the grinding wheel on a large machine can be changed. Think of the resulting savings in costly toolroom labor and materials.

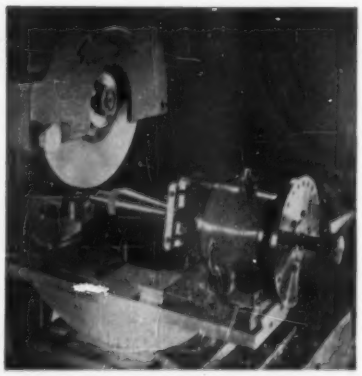
With it, in one setting, you can now grind flat, curved or circular work—in any combination of taper or contour—all within .0005". The index plate allows indexing in the same operation, too. Tapers can be reversed or changed by loosening two screws in the rocking bed, and the index plate can be engaged by merely pressing a plunger. The simple tail-stock center readily permits the use of specials—male, female or cutaway.

CATALOG WITH 20 ACTION PHOTOGRAPHS will show you graphically how you can use this versatile tool for production and inspection, too. In it are examples of some of the many difficult toolroom jobs you can handle easily: double tapers, equally spaced slots, small cylindrically tapered punches and many others. It's yours for the asking.

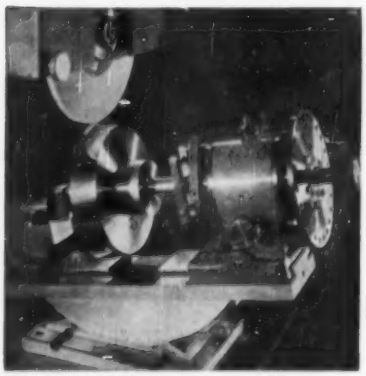
SPECIFICATIONS

Length—overall	12"
Width—including motor	10"
Height—overall	8"
Distance between centers—maximum	6"
Centers will swing	6"
Maximum grinding angle (using 10° angle block)	30°
Motor	1/25 H.P., 115 volt, 60 cycle

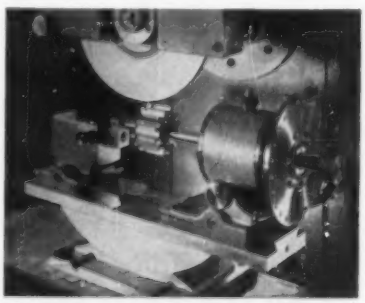
MOORE SPECIAL TOOL COMPANY, INC.
738 Union Avenue, Bridgeport 7, Conn.



Double tapers and hex shoulder ground with a single set-up. Rocking bed is equipped with a tangential screw for fine-setting taper angles.



Grinding a 10° taper on a machine part 5" long, 5" in diameter on centers.



12 equally spaced slots in punch holder ground by using index plate.

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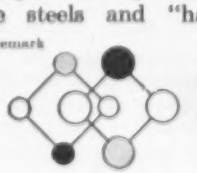

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Regardless of the size of your shop, if you have high production jobs, you'll find an extraordinary reduction in tooling and manufacturing costs when you use U. S. Drill Heads.

The heads shown here, moderate in cost, are for use with automatic chucking machines and turret lathes, for drilling or tapping operations. They provide, in most cases, that a part can be completely finished in one handling.

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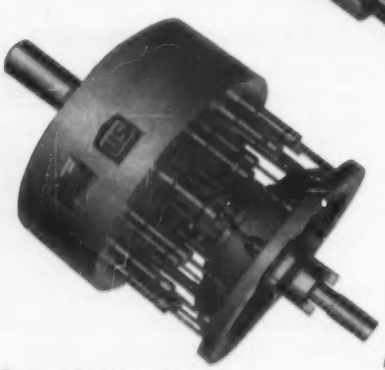

For semi-automatic setup.

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THE UNITED STATES DRILL HEAD COMPANY

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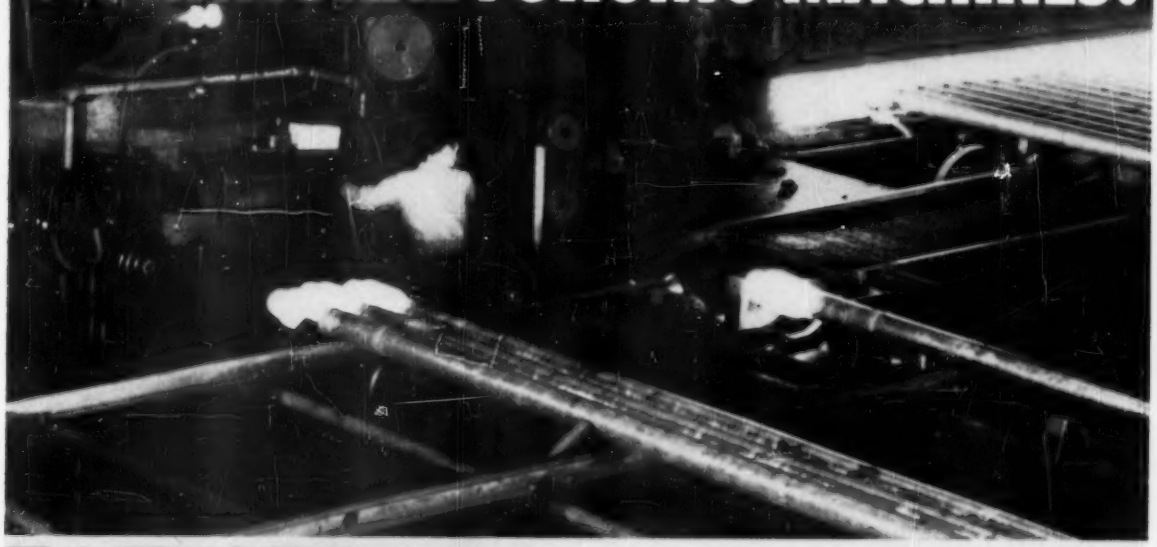

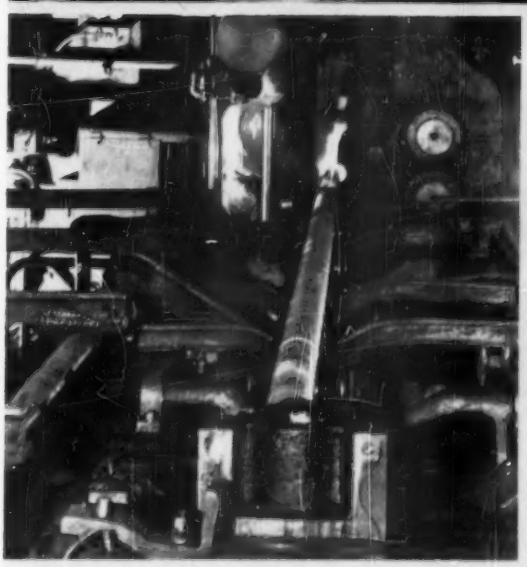

Upsetting tubing on a National Forging Machine at the Jones & Laughlin Aliquippa Works.

Jones and Laughlin Steel Corporation, recognized outstanding experts on upset tubing as well as other forgings, rely upon National Forging Machines for this type of exacting work. At present on the job at the Aliquippa Works of J&L, are National 6″ and 7½″ Forging Machines. Their new 10″ National — the largest size upsetter being built today — will be scheduled to go into production soon.

Here is another example in which industry's leaders and National Machinery "team up" to solve difficult forging problems.

If you have a forging problem—large or small, hot or cold, ferrous or non-ferrous—we invite you to send us your samples or prints. Better yet, pay us a visit. *Let's approach tomorrow's new and better ways of forging metal parts in the light of methods and ideas which our people are already testing today!*

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO—SINCE 1874

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS • BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS

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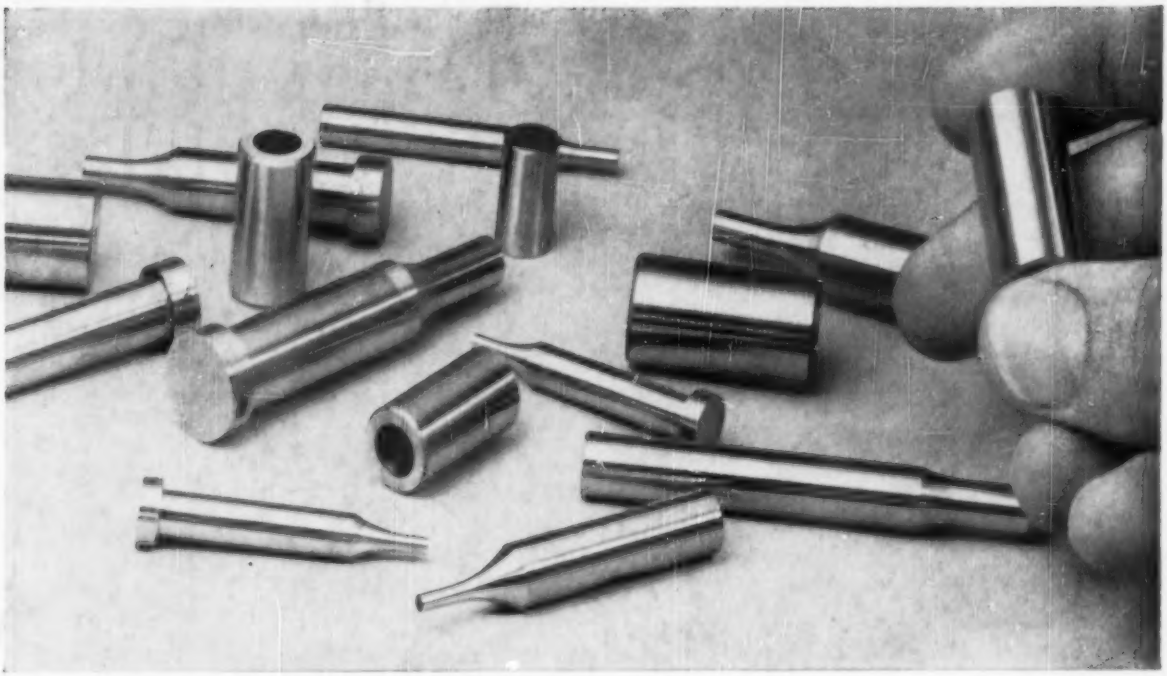

How the country's largest exclusive producer of punches and dies changed complaints to contracts

. . . with Graph-Mo® steel

PORTER Precision Products, Cincinnati, Ohio, is the country's largest exclusive manufacturer of punches and dies—37,000 different sizes in stock. Formerly, Porter produced these products from water-hardening and other high-carbon tool steels, but found that such steels presented distinct disadvantages. For example, they distorted in heat treating, were relatively expensive and difficult to machine, and did not meet customers' demands for longer life.

With a view to correcting these problems, Porter engineers adopted Graph-Mo®—one of four graphitic tool steels developed by the Timken Company—as a standard for the manufacture of punches and die buttons. Because it contains free graphite, Graph-Mo is easier to machine. And punches and dies made of Graph-Mo don't scuff or gall. From every aspect, Porter's adoption of Graph-Mo steel has proved eminently successful.

Graph-Mo outwears ordinary tool steels on an average of three to one. Millions of tiny particles of diamond-hard carbide—one of the most wear-resistant substances known—give Graph-Mo steel longer service life.

Graph-Mo may be the solution to *your* punch and die problems. For more information about all four graphitic steels developed by the Timken Company, and their uses in dies, punches, gages, and machine parts, write for the new Timken Graphitic Steel Data Book. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING